A175-1U 7/91

AMERICAN CANCER SOCIETY®

CANCER FACTS & FIGURES–1991

Estimated number of new cancer cases in 1991 by state, total: 1,100,000 (excluding Puerto Rico)*.

*Excluding nonmelanoma skin cancer and carcinoma in situ.
BASED ON RATES FROM NCI SEER PROGRAM (1985-1987).

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SOURCES OF STATISTICS

Incidence

Since there is no nationwide cancer registry, there is no way of knowing exactly how many new cases of cancer are diagnosed each year. The American Cancer Society estimates cancer incidence for the current year using the best available data sources.

Estimates of cancer incidence in *Cancer Facts & Figures* editions prior to 1974 were based on rates from two state cancer registries, the Connecticut Tumor Registry and the New York State Tumor Registry. The issues from 1974 through 1978 used information from the National Cancer Institute's Third National Cancer Survey (1969-1971) of nine major areas of the United States. In 1973, the NCI began the Surveillance, Epidemiology and End Results (SEER) program to collect ongoing data on cancer incidence and patient survival. The SEER program includes data from nine population-based cancer registries, covering about 10% of the US population. Beginning with the 1979 edition of *Facts & Figures*, estimates of cancer incidence have been based on incidence rates obtained through the SEER program, applied to the US Census estimates of the population for the current year.

It is not appropriate or accurate to evaluate cancer incidence and mortality trends using only ACS estimates of cases and deaths, since these numbers are projected before the year begins, using data that are several years old. The numbers are presented to give the best available measure of the scope of the disease in the US at the time of publication. Comparable incidence rates are available for 1973 through 1987 from the National Cancer Institute's SEER program to evaluate cancer trends.

The estimates of total US cancer cases diagnosed in 1991 are based on age-specific incidence rates from the SEER program for 1985-1987 applied to the 1991 Census population projections. Some adjustment is made for sites with recently increasing or decreasing rates. Estimated new cases by state are calculated according to the distribution of estimated 1991 cancer deaths by state for each primary cancer site.

Mortality

The source for mortality statistics for *Cancer Facts & Figures* has always been the Division of Vital Statistics, National Center for Health Statistics, Department of Health and Human Services.

The 1991 estimates of cancer deaths are based on cancer mortality data from 1981 through 1987.

Beginning with the 1981 edition of *Facts & Figures*, age-adjusted mortality rates per 100,000 population are standardized to the 1970 census population distribution, rather than the 1940 census population. Age-adjustment or age-standardization is a method used to make valid statistical comparisons among rates by assuming the same age distribution occurs among the different groups begin compared.

Death rates by state: In the 1990 and 1991 *Facts & Figures*, actual age-adjusted mortality rates, based on reported deaths in a recent period, are presented. For *Facts & Figures* 1969-1987 crude death rates were projected for the upcoming year. For *Facts & Figures* 1988 and 1989, age-adjusted death rates were projected. These rates are not comparable and should not be used to evaluate trends over time.

Survival

Cancer survival statistics are usually reported as five-year relative survival rates. In this edition, we present survival statistics for cases diagnosed in the period 1974-1986, as reported from the SEER program. The relative survival rate is the ratio of the observed survival rate for the patient group to the expected survival rate for persons in the general population similar to the patient group with respect to age, sex, race, and calendar year of observation. Because there is a certain lag time required in measuring survival, these rates may not reflect the most recent treatment advances.

Changes in 1991

Uterine cancer deaths: In 1991, the cervical cancer death estimate is based on reported cervical cancer deaths only. Unspecified uterine cancer deaths are included with corpus. This reflects a change in the method of allocating unspecified uterine cancer deaths rather than a sharp decline in the number of cervical cancer deaths (p. 5).

Could more people be saved? A new calculation method, based on 1991 case estimates rather than death estimates, was used for *Facts & Figures* 1991 (p. 1).

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Cancer: Basic Data

What is cancer?

Cancer is a large group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled or checked, it results in death. However, many cancers can be cured if detected and treated promptly, and many others can be prevented by lifestyle changes, especially avoidance of tobacco.

How is cancer treated?

By surgery, radiation, radioactive substances, chemicals, hormones, and immunotherapy.

Who gets cancer?

Cancer strikes at any age. It kills more children age 1 to 14 in the US than any other disease and occurs more frequently with advancing age. In the 1980s, it was estimated there were over 4.5 million cancer deaths, almost 9 million new cancer cases, and some 12 million people under medical care for cancer.

How many people alive today will get cancer?

About 76 million Americans now living will eventually have cancer; about one in three, according to present rates. Over the years, cancer will strike in approximately three of four families.

How many people alive today have ever had cancer?

There are over 7 million Americans alive today who have a history of cancer, 3 million diagnosed five or more years ago. Most of these 3 million can be considered cured, while others still have evidence of cancer. By "cured" it is meant that a patient has no evidence of disease and has the same life expectancy as a person who never had cancer.

The decision as to when a patient may be considered cured is made by the physician after examining the individual patient. For most forms of cancer, five years without symptoms following treatment is the accepted time. Nevertheless, some patients can be considered cured after one year and others after three years, but some have to be observed much longer than five years.

How many new cases will there be this year?

In 1991 about 1,100,000 people will be diagnosed as having cancer. This estimate does not include nonmelanoma skin cancer and carcinoma in situ. The incidence of basal and squamous cell skin cancers is estimated to be over 600,000 cases annually.

How many people are surviving cancer?

In the early 1900s few cancer patients had any hope of long-term survival. In the 1930s less than one in five was alive at least five years after treatment. In the 1940s it was one in four, and in the 1960s it was one in three.

Today, about 440,000 Americans, or 4 of 10 patients who get cancer this year, will be alive 5 years after diagnosis. The gain from 1 in 3 to 4 in 10 represents about 77,000 persons this year. This 4 in 10, or about 40% is called the "observed" survival rate. When normal life expectancy is taken into consideration (factors such as dying of heart disease, accidents, and diseases of old age) a "relative" five-year survival rate of 50% is seen for all cancers. The relative survival rate is commonly used to measure progress in the early detection and treatment of cancer and estimates the proportion of cancer patients potentially curable.

Could more people be saved?

Regular screening and self-exams can detect cancers of the breast, tongue, mouth, colon, rectum, cervix, prostate, testis, and melanoma at an early stage when treatment is more likely to be successful. These sites include nearly half of all new cases. Of these cases, about two-thirds of all patients currently survive five years. With early detection about 87% would survive. This means that of those persons diagnosed with these cancers in 1991, nearly 100,000 more would survive if their cancers had been detected in a localized stage and treated promptly. In addition, about 90% of the 600,000 skin cancers to be diagnosed in 1991 could have been prevented by protection from the sun's rays. All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The ACS estimates that in 1991, 155,000 lives will be lost to cancer because of tobacco smoking. About 16,000 cancer deaths will be related to excessive alcohol use, frequently in combination with cigarette smoking.

How many people will die?

This year about 514,000 will die of the disease—about 1,400 people a day. Of every five deaths from all causes in the US, one is from cancer. In 1990 an estimated 510,000 Americans died of cancer. In 1989 it was about 502,000; in 1988 the figure was 485,048.

What is the national death rate?

There has been a steady rise in the age-adjusted national death rate. In 1930 the number of cancer deaths per 100,000 population was 143. In 1940 it was 152. By 1950 it had risen to 158 and since 1984 has been 171. The major cause of these increases has been cancer of the lung. Age-adjusted cancer death rates for many major cancer sites have leveled off or declined over the past 50 years (see p. 3).

HOW CANCER WORKS

Normally, the cells that make up the body reproduce in an orderly manner, so that worn-out tissues are replaced, injuries are repaired, and growth of the body proceeds.

Occasionally, certain cells undergo a change that is abnormal, and thus begin a process of uncontrolled growth and spread. These cells may grow into masses of tissue called tumors. Some tumors are benign and others are malignant (cancerous).

The danger of cancer is that it invades and destroys normal tissue. In the beginning, cancer cells usually remain at their original site, and the cancer is said to be localized. Later, cancer cells may metastasize (i.e., they invade distant or neighboring organs or tissue). This occurs either by direct extension of growth, or by cells becoming detached and carried through the lymph or blood systems to other parts of the body.

Metastasis may be regional—confined to one region of the body—when cells are trapped by lymph nodes. If left untreated, however, the cancer is likely to spread throughout the body. That condition is known as advanced cancer, and usually results in death.

Systems have been designed to define what stage a cancer has reached. Because cancer becomes more serious with each stage, it is important to detect cancer as early as possible. Aids to early detection include knowing cancer's Seven Warning Signals and the Cancer Risk Factors.

TRENDS IN DIAGNOSIS AND TREATMENT

The diagnosis and treatment of cancer has become increasingly individualized. Early detection is followed by more precise staging, and the use of more than one kind of therapy, often in combination.

Some cancers that, only a few decades ago, had a very poor outlook, are often being cured today: acute lymphocytic leukemia in children, Hodgkin's disease, Burkitt's lymphoma, Ewing's sarcoma (a form of bone cancer), Wilms' tumor (a kidney cancer in children), rhabdomyosarcoma (a cancer in certain muscle tissue), choriocarcinoma (placental cancer), testicular cancer, and osteogenic sarcoma. Other cancers have not yet yielded to effective treatment, and are the focus of continuing research.

An outstanding example of progress is the improvement in the management of testicular cancer in young men. More precise diagnostic tools and staging allow better selection of treatment. The use of combinations of cancer drugs has resulted in remarkably improved survival. In 20 years, the 5-year survival rate of testicular cancer rose from 63% to 91%.

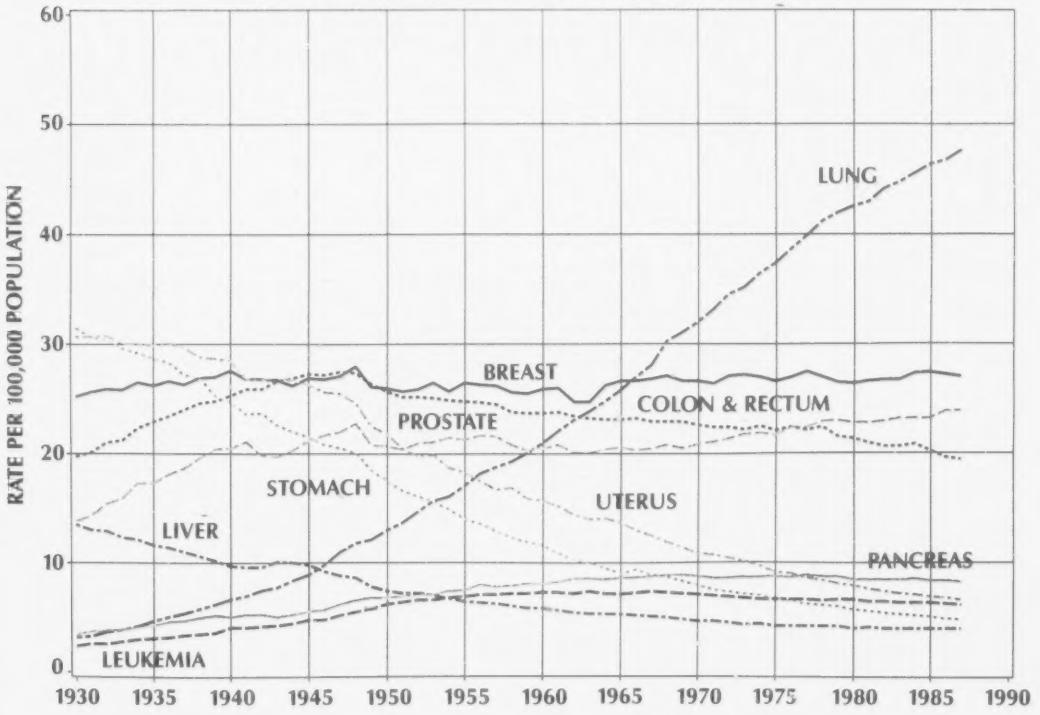
The following developments indicate the directions of current and future research:

- New findings in genetics are revealing the importance of oncogenes. These genes are found in tumor cells. Their activation is associated with the transformation of normal cells into cancer cells. Analysis of products of these oncogenes is a promising new means to predict which tumors are likely to recur after surgery or to identify family members at risk.
- Use of potent growth factors stimulates normal bone marrow cells to withstand very high doses of chemotherapeutic drugs.
- A genetic fusing of cancer cells with normal cells can produce disease-fighting monoclonal antibodies (specific antibodies tailored to seek out chosen targets on cancer cells). Their potential in the diagnosis and treatment of cancer is under study.
- New ways have been found to treat early breast and colon cancers with drugs postoperatively. This "adjuvant" treatment may eradicate cancer cells remaining after surgery and increase cure rates.
- Neoadjuvant chemotherapy (giving chemotherapy to shrink the cancer and then removing it surgically) has been successful against certain types of cancers.
- New understanding of the causes of pain in cancer patients has increased the options for controlling pain. Regular use of orally administered pain medicines, infusions or injections of analgesics, and procedures to interrupt pain pathways are among the effective approaches available.
- Researchers are examining synthetic retinoids (cousins of vitamin A) and other substances to see if recurrences of certain cancers can be prevented. Another step is to see if these agents can reduce cancer in high-risk groups.
- In clinical trials, a new agent, Taxol, obtained currently from the bark of yew trees, has been effective in treating ovarian cancer.
- New approaches to drug therapy use combinations of chemotherapeutic drugs, or chemotherapy plus surgery or radiation. New classes of agents are being tested for their effectiveness in treating patients whose disease is resistant to drug therapies now in use.
- Many patients with primary bone cancer now are treated successfully by removing and replacing a section of bone rather than by amputating the leg or arm. Drugs and radiation therapy are being used effectively after bone cancer surgery, resulting in dramatic improvement in survival.
- New high-technology diagnostic imaging techniques have replaced exploratory surgery for some cancer patients. Magnetic resonance imaging (MRI) is one example of such technology. In MRI, a huge electromagnet is used to detect hidden tumors by mapping, on a computer screen, the vibrations of the various atoms in the body. Computerized tomography (CT) scanning uses x-rays to examine parts of the body. In both of these painless, non-invasive procedures, cross-section pictures can show a tumor's shape and location more accurately than is possible with conventional x-ray techniques. For patients undergoing radiation therapy, CT scanning may enable the therapist to pinpoint the tumor more precisely, and thus provide more accurate radiation dosage while sparing normal tissue.
- Immunotherapy holds the hope of enhancing the body's own disease-fighting systems to control cancer. Interferon (naturally occurring body proteins

that are capable of killing cancer cells or stopping their growth), interleukin-2 (a growth factor that greatly stimulates cells of the immune system to directly fight cancer), and other biologic response modifiers are under study. Recently, interferon was made available as the treatment for hairy cell leukemia, a rare blood cancer of older Americans. Interleukin-2 is under very active research in the treatment of kidney cancer and melanoma.

- Many cancers are caused by a two-stage process through exposure to substances known as initiators and promoters. Research scientists are exploring ways of interrupting this process to prevent the development of cancer.
- New technologies have made it possible to use bone marrow transplantation as an important treatment option in selected patients with aplastic anemia or leukemia, and bone marrow transplantation for other cancers is under study. Because disruption of bone marrow function is a side effect of some cancer treatments, researchers are evaluating autologous bone marrow transplants, in which a portion of the patient's own marrow is removed before treatment, saved, and later restored. This procedure eliminates the problems of matching a donor with the recipient patient, and may make it possible for the patient to tolerate larger doses of anticancer drugs or radiation therapy.
- Hyperthermia is a way to increase the heat or temperature of the entire body or a part of the body. It is known that heat can kill cancer cells. A cell temperature of 45° centigrade kills cancer cells. A temperature of 42-43° centigrade makes the cell more susceptible to damage by ionizing radiation (x-rays). Studies are underway to learn if hyperthermia can increase the effect of radiation and chemotherapy.
- With medical progress producing longer survival periods for many cancer patients, clinical concerns are expanding to include not only patients' physical well-being but also their psychosocial needs. The response of both patient and family to the disease, the patient's sexual concerns, employment and insurance needs, and ways to provide psychosocial support have emerged as important areas of research and clinical care.
- Improvements in cancer treatment have made possible more conservative management of some early cancers. In early cancer of the larynx, many patients are now able to retain the larynx and voice; in colorectal cancer, fewer permanent colostomies are needed; and the surgery required in many cases of breast cancer is often more limited.
- Prostatic ultrasound (a rectal probe using ultrasonic waves to produce an image of the prostate) is currently being investigated as a potential means to increase the early detection of occult (not clinically suspected) prostate cancer.

CANCER DEATH RATES BY SITE, UNITED STATES, 1930-87



*Rate for the population standardized for age on the 1970 US population.
Sources of Data: National Center for Health Statistics and Bureau of the Census, United States.
Note: Rates are for both sexes combined except breast and uterus (female population only) and prostate (male population only).

30-YEAR TRENDS IN AGE-ADJUSTED CANCER DEATH RATES PER 100,000 POPULATION 1955-57 to 1985-87

SITES	SEX	1955-57	1985-87	PERCENT CHANGES	COMMENTS
ALL SITES	Male	179.5	216.6	+ 21	Steady increase mainly due to lung cancer.
	Female	141.3	139.8	*	Early decrease, but recent increases due to lung cancer.
ORAL	Male	6.1	4.8	- 22	Steady decrease.
	Female	1.5	1.8	+ 18	Slight fluctuations; overall no change.
ESOPHAGUS	Male	4.7	5.7	+ 20	Some fluctuations; small increase.
	Female	1.2	1.5	+ 22	Slight fluctuations; small increase.
STOMACH	Male	19.5	7.2	- 63	Steady decrease in both sexes; reasons unknown.
	Female	10.1	3.3	- 68	
COLON & RECTUM	Male	25.8	24.0	- 7	Slight fluctuations; overall no change.
	Female	23.9	16.8	- 30	Slow, steady decrease.
COLON	Male	17.1	20.2	+ 19	Slow steady increase, then leveling in recent years.
	Female	17.9	14.6	- 18	Slow, steady decrease.
RECTUM	Male	8.6	3.7	- 58	Slow, steady decrease in both sexes.
	Female	5.9	2.2	- 37	
LIVER†	Male	6.0	4.9	- 18	Slow, steady decrease in both sexes.
	Female	6.5	3.3	- 49	
PANCREAS	Male	9.7	10.0	*	Early increase, then leveling off and decreasing.
	Female	6.1	7.2	+ 18	Steady increase.
LARYNX	Male	2.6	2.5	*	Slight fluctuations; overall no change.
	Female	0.2	0.5	+150	Steady increase in women.
LUNG	Male	31.9	73.6	+131	Steady increase in both sexes due to cigarette smoking.
	Female	5.2	27.2	+420	
MELANOMA OF SKIN	Male	1.3	2.9	+132	Steady increase in both sexes.
	Female	1.0	1.5	+ 45	
OTHER SKIN	Male	1.8	1.3	- 26	Steady decrease in both sexes.
	Female	1.0	0.3	- 66	
BREAST	Male	0.3	0.3	- 11	Steady decrease.
	Female	26.3	27.2	*	Slight fluctuations; overall no change.
CERVIX UTERI	Female	10.2	3.1	- 70	Steady decrease.
OTHER UTERUS	Female	7.3	3.6	- 50	Steady decrease.
OVARY	Female	8.7	7.8	- 10	Early increase; then leveling off and decrease.
PROSTATE	Male	21.5	23.7	+ 10	Slight increase in recent years.
BLADDER	Male	7.2	5.8	- 20	Slight decrease in recent years.
	Female	2.9	1.7	-43	Some fluctuations; noticeable decrease.
KIDNEY	Male	3.6	5.0	+ 37	Steady increase.
	Female	2.0	2.4	+ 18	Slight fluctuations; overall no change.
BRAIN	Male	4.0	4.9	+ 21	Early increase in both sexes; later leveling off, reasons unknown.
	Female	2.7	3.3	+ 24	
NON-HODGKIN'S LYMPHOMA	Male	4.7	7.1	+ 53	Steady increase in both sexes.
	Female	3.0	4.8	+ 59	
HODGKIN'S DISEASE	Male	2.3	0.8	- 66	Steady decrease in both sexes.
	Female	1.4	0.5	- 63	
MULTIPLE MYELOMA	Male	1.8	3.5	+100	Steady increase in both sexes.
	Female	1.2	2.4	+ 97	
LEUKEMIA	Male	8.5	8.2	*	Early increase, later leveling off and decreasing.
	Female	5.6	4.9	- 12	Early slight increase; later leveling off and decreasing.

*Percent changes not listed because they are not meaningful. †Primary and non-specified.

ESTIMATED NEW CANCER CASES AND DEATHS BY SEX FOR ALL SITES—1991*

	ESTIMATED NEW CASES			ESTIMATED DEATHS		
	Total	Male	Female	Total	Male	Female
ALL SITES	1,100,000*	545,000*	555,000*	514,000	272,000	242,000
Buccal Cavity & Pharynx **(ORAL)**	30,800	20,600	10,200	8,150	5,275	2,875
Lip	3,600	3,100	500	100	75	25
Tongue	6,200	3,900	2,300	1,850	1,200	650
Mouth	11,600	6,900	4,700	2,400	1,400	1,000
Pharynx	9,400	6,700	2,700	3,800	2,600	1,200
Digestive Organs	240,800	125,400	115,400	122,975	64,700	58,275
Esophagus	10,900	7,600	3,300	9,800	7,300	2,500
Stomach	23,800	14,500	9,300	13,400	8,100	5,300
Small Intestine	2,900	1,600	1,300	925	500	425
Large Intestine } **(COLON-RECTUM)**	112,000	54,000	58,000	53,000	26,000	27,000
Rectum }	45,500	25,000	20,500	7,500	4,000	3,500
Liver & Biliary Passages	15,000	7,800	7,200	12,100	6,300	5,800
Pancreas	28,200	13,700	14,500	25,200	12,000	13,200
Other & Unspecified Digestive	2,500	1,200	1,300	1,050	500	550
Respiratory System	178,000	114,000	64,000	148,025	95,800	52,225
Larynx	12,500	10,000	2,500	3,650	2,900	750
LUNG	161,000	101,000	60,000	143,000	92,000	51,000
Other & Unspecified Respiratory	4,500	3,000	1,500	1,375	900	475
Bone	2,000	1,100	900	1,050	550	500
Connective Tissue	5,800	3,100	2,700	3,300	1,600	1,700
SKIN	32,000†	17,000†	15,000†	8,500‡	5,400	3,100
BREAST	175,900	900	175,000	44,800	300	44,500
Genital Organs	201,000	129,300	71,700	56,125	32,625	23,500
Cervix } **(UTERUS)**	13,000	—	13,000	4,500	—	4,500
Corpus & Unspecified }	33,000	—	33,000	5,500	—	5,500
Ovary	20,700	—	20,700	12,500	—	12,500
Other & Unspecified Genital, Female	5,000	—	5,000	1,000	—	1,000
Prostate	122,000	122,000	—	32,000	32,000	—
Testis	6,100	6,100	—	375	375	—
Other & Unspecified Genital, Male	1,200	1,200	—	250	250	—
Urinary Organs	75,500	52,800	22,700	20,100	12,700	7,400
Bladder	50,200	37,000	13,200	9,500	6,400	3,100
Kidney & Other Urinary	25,300	15,800	9,500	10,600	6,300	4,300
Eye	1,700	900	800	300	150	150
Brain & Central Nervous System	16,700	9,000	7,700	11,500	6,200	5,300
Endocrine Glands	13,900	4,100	9,800	1,675	700	975
Thyroid	12,400	3,300	9,100	1,000	350	650
Other Endocrine	1,500	800	700	675	350	325
Leukemia	28,000	15,800	12,200	18,100	9,800	8,300
Lymphocytic Leukemia	11,700	6,800	4,900	5,200	3,000	2,200
Granulocytic Leukemia	11,600	6,300	5,300	7,600	4,000	3,600
Other & Unspecified Leukemia	4,700	2,700	2,000	5,300	2,800	2,500
Other Blood & Lymph Tissues	56,900	30,000	26,900	29,400	15,200	14,200
Hodgkin's Disease	7,400	4,200	3,200	1,600	1,000	600
Non-Hodgkin's Lymphoma	37,200	19,600	17,600	18,700	9,600	9,100
Multiple Myeloma	12,300	6,200	6,100	9,100	4,600	4,500
All Other & Unspecified Sites	41,000	21,000	20,000	40,000	21,000	19,000

NOTE: ACS six major sites appear in boldface caps.

*Carcinoma in situ and nonmelanoma skin cancers are not included in totals. Carcinoma in situ of the uterine cervix accounts for about 50,000 new cases annually, carcinoma in situ of the female breast accounts for about 15,000 new cases annually, and melanoma carcinoma in situ accounts for about 6,000 new cases annually. Overall, about 100,000 new cases of carcinoma in situ of all sites of cancer are diagnosed each year. Basal cell and squamous cell skin cancer account for more than 600,000 new cases annually.

†Melanoma only.

‡Melanoma 6,500; other skin 2,000.

INCIDENCE ESTIMATES ARE BASED ON RATES FROM NCI SEER PROGRAM 1985-87.

NEW CANCER CASES—1991

Estimated New Cancer Cases for All Sites Plus Major Sites, by State—1991

STATE	ALL SITES*	MAJOR SITES								
	Number of Cases	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	19,600	2,600	2,400	3,100	600	850	2,200	550	500	450
Alaska	1,200	175	150	200	30	40	75	50	25	40
Arizona	15,200	2,300	1,900	2,200	275	600	1,700	475	350	400
Arkansas	12,200	1,500	1,600	2,100	250	425	1,300	350	325	300
California	110,000	18,000	14,900	15,600	3,100	4,600	12,200	3,800	3,000	3,100
Colorado	10,300	1,800	1,600	1,300	250	350	1,100	400	300	275
Connecticut	15,800	2,800	2,400	2,100	475	650	1,600	450	450	350
Delaware	3,100	550	425	450	100	125	375	100	60	80
Dist. of Columbia	3,600	550	500	450	125	200	550	100	70	80
Florida	73,000	10,500	10,600	11,500	2,500	2,500	9,000	2,200	1,900	1,800
Georgia	25,600	4,200	3,200	4,000	1,000	1,100	3,100	800	600	600
Hawaii	3,500	450	550	500	150	150	350	90	90	100
Idaho	3,600	500	500	450	100	175	500	150	125	90
Illinois	52,000	8,600	8,000	7,600	1,200	2,400	5,300	1,200	1,400	1,300
Indiana	25,700	3,900	3,800	3,900	650	1,000	2,900	650	650	650
Iowa	13,100	2,200	2,300	1,800	450	500	1,700	400	350	325
Kansas	10,400	1,700	1,700	1,500	200	475	1,200	325	300	350
Kentucky	17,300	2,300	2,400	3,100	425	700	1,600	450	400	375
Louisiana	19,100	2,400	2,700	3,000	650	1,000	2,000	425	500	400
Maine	6,300	800	950	850	225	300	600	150	150	175
Maryland	21,000	3,400	2,900	3,200	550	800	2,100	500	550	475
Massachusetts	29,700	5,500	4,700	4,000	800	1,200	3,000	850	750	700
Michigan	40,000	6,400	5,200	5,800	1,100	1,600	4,600	750	1,000	1,100
Minnesota	17,700	3,100	2,500	2,200	400	700	2,300	425	550	600
Mississippi	11,800	1,600	1,500	1,800	350	500	1,300	300	325	300
Missouri	24,700	4,000	3,500	3,800	550	950	2,800	600	600	600
Montana	3,400	500	500	450	100	175	500	100	90	80
Nebraska	6,900	1,100	1,200	1,000	100	225	800	275	150	175
Nevada	4,900	700	600	850	150	175	375	150	125	100
New Hampshire	4,800	850	750	650	150	200	550	125	125	100
New Jersey	39,100	6,800	6,100	5,400	1,200	1,700	4,100	1,100	900	900
New Mexico	5,100	900	700	600	100	175	650	150	150	150
New York	85,000	15,300	13,900	11,200	2,700	3,500	9,000	2,700	2,300	1,900
North Carolina	28,700	4,900	3,900	4,400	850	1,200	3,400	900	750	650
North Dakota	2,900	425	425	375	90	150	500	60	90	100
Ohio	52,000	8,200	7,800	7,800	1,400	2,400	5,200	1,300	1,300	1,300
Oklahoma	14,700	2,000	2,000	2,400	450	750	1,600	475	350	425
Oregon	13,000	1,900	1,700	2,100	375	550	1,700	425	325	325
Pennsylvania	65,000	10,300	10,100	9,100	1,500	3,000	7,000	1,900	1,500	1,800
Rhode Island	5,300	1,000	800	750	225	250	600	150	125	100
South Carolina	14,200	2,100	1,800	2,200	650	750	1,800	500	400	400
South Dakota	3,200	500	550	425	75	125	500	125	90	90
Tennessee	23,200	3,400	3,100	3,800	550	1,100	2,300	750	550	650
Texas	59,000	8,800	7,100	8,700	1,500	2,400	5,900	1,800	1,500	1,600
Utah	3,900	650	550	350	90	200	550	125	100	150
Vermont	2,400	475	300	350	60	100	350	75	70	80
Virginia	26,000	4,200	3,600	4,100	700	1,000	3,000	750	600	600
Washington	19,100	3,000	2,500	2,900	500	650	2,400	650	475	475
West Virginia	10,000	1,400	1,400	1,800	200	475	1,000	275	225	225
Wisconsin	21,200	3,500	3,100	2,600	550	800	2,600	550	550	550
Wyoming	1,500	275	150	200	30	60	175	50	40	60
United States	1,100,000	175,000	157,500	161,000	30,800	46,000	122,000	32,000	28,200	28,000
Puerto Rico	7,000	900	650	500	450	400	850	60	175	200

*Does not include carcinoma in situ or nonmelanoma skin cancer.

These estimates are offered as a rough guide and should not be regarded as definitive. They are calculated according to the distribution of estimated 1991 cancer deaths by state.

CANCER DEATHS—1991
Estimated Cancer Deaths for All Sites Plus Major Sites, by State—1991

	ALL SITES		MAJOR SITES								
STATE	Number of Deaths	Death Rate per 100,000 Population*	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	9,200	176	650	900	2,700	150	175	575	100	450	300
Alaska	500	189	50	50	175	10	10	20	10	25	25
Arizona	7,000	154	550	750	1,900	75	125	450	90	325	250
Arkansas	5,700	167	400	600	1,900	75	90	325	70	275	200
California	52,000	168	4,600	5,700	13,900	800	1,000	3,200	800	2,700	2,000
Colorado	4,800	144	450	600	1,200	75	75	300	80	250	175
Connecticut	7,400	173	700	900	1,800	125	125	425	100	425	225
Delaware	1,400	190	150	150	375	30	30	100	20	50	50
Dist. of Columbia	1,700	222	150	200	400	50	50	150	20	60	50
Florida	34,000	162	2,700	4,100	10,300	650	550	2,300	450	1,700	1,100
Georgia	11,900	174	1,100	1,200	3,500	250	225	800	150	550	400
Hawaii	1,600	138	125	225	425	40	30	90	20	80	60
Idaho	1,700	146	125	200	400	25	40	125	30	100	60
Illinois	24,400	176	2,200	3,100	6,800	325	550	1,400	225	1,200	850
Indiana	12,000	177	1,000	1,400	3,500	175	225	750	125	550	425
Iowa	6,200	158	550	900	1,600	125	100	450	80	325	225
Kansas	4,900	152	450	650	1,300	50	100	325	70	275	225
Kentucky	8,100	181	600	950	2,800	100	150	425	90	350	250
Louisiana	9,000	187	600	1,000	2,700	175	225	550	90	475	250
Maine	2,900	180	200	375	800	75	70	150	30	125	100
Maryland	9,800	194	850	1,100	2,800	150	175	550	100	500	325
Massachusetts	13,900	179	1,400	1,800	3,600	225	275	800	175	700	450
Michigan	18,600	176	1,600	2,000	5,100	300	350	1,200	150	900	700
Minnesota	8,300	154	800	1,000	1,900	100	150	600	90	500	375
Mississippi	5,500	168	400	600	1,600	100	100	350	60	300	200
Missouri	11,600	171	1,000	1,300	3,400	150	200	725	125	550	400
Montana	1,600	160	125	225	400	30	40	125	20	80	50
Nebraska	3,200	154	275	450	850	30	50	200	50	150	125
Nevada	2,300	185	175	225	750	40	40	100	30	100	60
New Hampshire	2,300	179	200	300	600	40	50	150	25	125	70
New Jersey	18,400	185	1,700	2,400	4,900	300	375	1,100	225	850	600
New Mexico	2,400	144	225	275	550	30	40	175	30	125	100
New York	39,500	177	3,900	5,300	10,000	700	800	2,400	550	2,000	1,300
North Carolina	13,600	166	1,300	1,500	3,900	225	250	900	200	650	425
North Dakota	1,300	151	100	150	325	25	30	125	10	80	70
Ohio	24,300	182	2,100	3,000	6,900	350	500	1,400	275	1,100	850
Oklahoma	6,900	165	500	750	2,100	125	175	400	100	325	275
Oregon	6,100	167	500	650	1,800	100	125	450	90	300	225
Pennsylvania	30,500	179	2,600	3,900	8,100	375	650	1,800	375	1,400	1,100
Rhode Island	2,500	181	250	325	650	50	50	150	30	100	70
South Carolina	6,600	170	500	700	1,900	175	150	450	100	350	250
South Dakota	1,500	153	125	200	375	20	25	125	25	80	60
Tennessee	10,800	173	850	1,200	3,400	150	250	600	150	500	400
Texas	27,500	158	2,200	2,700	7,700	400	500	1,500	350	1,300	1,000
Utah	1,800	122	175	225	325	25	40	150	25	80	90
Vermont	1,100	177	125	125	325	20	20	90	20	50	60
Virginia	12,100	182	1,100	1,400	3,600	200	225	800	150	550	375
Washington	8,900	165	750	950	2,600	125	125	650	125	425	300
West Virginia	4,700	176	350	550	1,600	50	100	275	60	200	150
Wisconsin	9,900	161	900	1,200	2,300	150	175	700	125	500	375
Wyoming	700	149	75	50	175	10	20	50	10	40	50
United States	514,000	171	44,500	60,500	143,000	8,150	10,000	32,000	6,500	25,200	18,100
Puerto Rico	4,000	128	250	350	550	175	150	325	25	175	150

*Average annual mortality rate for 1983-87, adjusted to the age distribution of the 1970 US Census Population.

Selected Cancer Sites

LUNG CANCER

Incidence: An estimated 161,000 new cases in 1991. The incidence rate, which had been increasing steadily in men and women for several decades, has begun to decline in men from a high of 86.6 per 100,000 in 1984 to 83.3 in 1987. The incidence rate in women continues to increase, to a high of 37.7 per 100,000 in 1987.

Mortality: An estimated 143,000 deaths in 1991. In 1987, for the first time, more women died of lung cancer than breast cancer which for over 40 years was the major cause of cancer death in women.

Warning Signals: Persistent cough, sputum streaked with blood, chest pain, recurring pneumonia or bronchitis.

Risk Factors: Cigarette smoking; history of smoking 20 or more years; exposure to certain industrial substances, such as arsenic, certain organic chemicals and asbestos, particularly for persons who smoke; radiation exposure from occupational, medical, and environmental sources. Residential radon exposure may increase risk, especially in cigarette smokers. Exposure to sidestream cigarette smoke increases the risk for nonsmokers.

Early Detection: Because symptoms often don't appear until the disease is in advanced stages, early detection is very difficult. In smokers who stop smoking at the time of early precancerous cellular changes, damaged bronchial lining tissues often return to normal. Smokers who persist in smoking may form abnormal cell growth patterns that lead to cancer. Chest x-ray, analysis of the types of cells contained in sputum, and fiberoptic examination of the bronchial passages assist diagnosis.

Treatment: Determined by the type and stage of the cancer. Options include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. In small cell cancer, chemotherapy alone or combined with radiation has replaced surgery as the treatment of choice; on this regimen, a large percentage of patients experience remission, which in some cases is long-lasting.

Survival: The 5-year relative survival rate is only 13% in all patients, regardless of stage at diagnosis. The rate is 37% for cases detected when the disease is still localized, but only 20% of lung cancers are discovered that early.

PROSTATE CANCER

Incidence: An estimated 122,000 new cases in the United States during 1991. Approximately one of every 11 men will develop prostate cancer. This is the second most common cancer in men, after skin cancer.

Mortality: An estimated 32,000 deaths in 1991, the second leading cause of cancer deaths in men.

Warning Signals: Weak or interrupted urine flow; inability to urinate, or difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; pain or burning on urination; continuing pain in lower back, pelvis, or upper thighs. Most of these symptoms are nonspecific and may be similar to benign conditions such as infection or prostate enlargement.

Risk Factors: Incidence increases with age through the most advanced ages; over 80% of all prostate cancers are diagnosed in men over the age of 65. The disease is more common in northwestern Europe and North America. It is rare in the Near East, Africa, Central America, and South America. For reasons not currently known, black Americans have the highest incidence rate in the world. There is some familial association, but it is unclear whether this is due to genetic or environmental factors. Studies conducted internationally have shown that dietary fat may be a factor. Workers who are exposed to cadmium are at slightly higher risk.

Early Detection: Every man over 40 should have a rectal examination as part of his regular annual physical checkup. A new technique, prostate ultrasound, may reveal cancers too small to be detected by physical examination. This new approach may be of special benefit to men who are at high risk. Men over 40 should be alert to the signs and symptoms and should see their physician immediately should any occur. The key to saving lives is early detection.

Treatment: Surgery, alone or in combination with radiation and/or hormones, and anticancer drugs, are treatment options. Hormone treatment and anticancer drugs also may control prostate cancer for long periods by shrinking the size of the tumor, thus greatly relieving pain.

Survival: Sixty percent of all prostate cancers are discovered while still localized; the 5-year relative survival rate for patients whose tumors are diagnosed at this stage is 85%. Survival rates for all stages combined have steadily improved, and in the past 30 years have increased from 50% to 71%.

BREAST CANCER

Incidence: An estimated 175,000 new cases among women in the United States during 1991. Approximately one of every 9 women will develop breast cancer. Breast cancer occurs rarely in men. Breast cancer incidence rates have increased about 3% a year since 1980, going from 84.8 per 100,000 in 1980 to 111.9 in 1987. Some of this increase is believed to be due to screening programs detecting tumors before they become clinically apparent. Other reasons for the increase are not fully understood.

Mortality: An estimated 44,800 deaths (44,500 women; 300 men) in 1991; in women, the second major cause of cancer death. Although incidence rates are increasing, early detection and improved treatment have kept mortality rates fairly stable over the past 50 years.

Warning Signals: Breast changes that persist, such as a lump, thickening, swelling, dimpling, skin irritation, distortion, retraction, scaliness, pain, or tenderness of the nipple.

Risk Factors: Over age 50; personal or family history of breast cancer; never had children; first childbirth after age 30.

Early Detection: The American Cancer Society recommends monthly breast self-examination as a routine good health habit for women 20 years or older. Most breast lumps are not cancer, but only a physician can make a diagnosis.

The American Cancer Society and the National Cancer Institute, in their joint Breast Cancer Detection Demonstration program, found that mammography (x-ray examination using a low level of radiation) can reveal cancers too small to be felt by the most experienced examiner.

Besides its effectiveness in screening women without symptoms, mammography is recognized as a valuable diagnostic technique for women who do have findings suggestive of breast cancer. Once a breast lump is found, mammography can help determine if there are other lesions too small to be felt, in the same or opposite breast. All suspicious lumps should be biopsied for a definitive diagnosis, even when the mammography findings are described as normal.

The Society recommends a mammogram every year for asymptomatic women age 50 and over, and a baseline mammogram for those 35 to 39. Asymptomatic women 40 to 49 should have a mammogram every 1-2 years. In addition, a professional physical examination of the breast is recommended every three years for women 20 to 40, and every year for those over 40.

Treatment: Taking into account the medical situation and the patient's preferences, treatment may require lumpectomy (local removal of the tumor), mastectomy (surgical removal of the breast), radiation therapy, chemotherapy, or hormone manipulation therapy. Often, two or more methods are used in combination. Patients should discuss with their physicians possible options for the best management of their breast cancer.

New techniques in recent years have made breast reconstruction possible after mastectomy, and the cosmetic results are good. Reconstruction has become an important part of treatment and rehabilitation (see p. 23).

Survival: The 5-year survival rate for localized breast cancer has risen from 78% in the 1940s to 91% today. If the breast cancer is in situ (not invasive), the survival rate approaches 100%. If the cancer has spread regionally, however, the survival rate is 69%; for persons with distant metastases, the survival rate is 18%.

PANCREATIC CANCER

Incidence: An estimated 28,200 new cases in the United States in 1991.

Mortality: An estimated 25,200 deaths in 1991. Pancreatic cancer is the fifth leading cancer killer. Pancreatic cancer incidence and mortality rates have been fairly stable since the early 1970s, except among black women whose rates have increased slightly.

Warning Signals: Cancer of the pancreas is a "silent" disease, one that occurs without symptoms until it is in advanced stages.

Risk Factors: Risk increases with age after age 50, with the most cases occurring between ages 65 and 79. Smoking is a major risk factor; incidence is more than twice as high for smokers versus nonsmokers. Sex and race are factors; the disease is 30% more common in men, and occurs approximately 65% more frequently in black Americans than in white Americans. Some studies have suggested associations with chronic pancreatitis, diabetes, or cirrhosis, but these findings have not been confirmed. In countries where the diet is high in fat, the pancreatic cancer rates are higher.

Early Detection: At present, only a biopsy yields a certain diagnosis, and because of the "silent" course of the disease, the need for biopsy is likely to be obvious only after the disease has advanced. Researchers are focusing on ways to diagnose pancreatic cancer before it is so far advanced that it presents symptoms. Ultrasound imaging and computerized tomography (CT) scans are being tried.

Prevention: Very little is known about what causes the disease or how to prevent it.

Treatment: Surgery, radiation therapy, and anticancer drugs are treatment options, but have had little influence on the outcome. In 59% of cases, diagnosis is so late that none of these is used.

Survival: Only 3% of patients live more than 5 years after diagnosis. The 2% of patients whose cancers occur in the pancreas' insulin-producing cells, and not its duct cells, tend to live longer; approximately 30% of these patients live more than 3 years after diagnosis.

UTERINE CANCER

Incidence: An estimated 46,000 new invasive cases in 1991, including 13,000 cases of cancer of the cervix and 33,000 cases of cancer of the corpus (body) of the uterus, usually of the endometrium (lining). The incidence of invasive cervical cancer has steadily decreased over the years. Carcinoma in situ rates have risen slightly in women under 50 in recent years. Cervical cancer is most common today among women of low socioeconomic groups, but all women are at risk. Endometrial cancer is most common in mature women, and diagnosis usually is made after age 50.

Mortality: An estimated 4,500 deaths in 1991 from cervical cancer and 5,500 from endometrial cancer or unspecified uterine cancer. Overall, the death rate for uterine cancer has decreased more than 70% over the past 40 years, due mainly to the Pap test for early detection of cervical cancer and regular checkups.

Warning Signals: Bleeding outside of the normal menstrual period or after menopause, or unusual vaginal discharge.

Risk Factors: For cervical cancer: early age at first intercourse, multiple sex partners, cigarette smoking, and certain sexually transmitted diseases. For endometrial cancer: history of infertility, failure to ovulate, prolonged estrogen therapy, obesity.

Early Detection: The Pap test is a valuable simple procedure that can be performed at appropriate intervals by physicians as part of a pelvic examination. A small sample of cells is swabbed from the cervix and body of the uterus, transferred to a slide, and examined under a microscope. This test should be performed annually with a pelvic examination in women who are or have been sexually active or who have reached age 18 years. After three or more consecutive annual examinations with normal findings, the Pap test may be performed less frequently at the discretion of the physician.

The Pap test is highly effective in detecting early cancer of the uterine cervix; it is only partially effective in detecting endometrial cancer. Women at high risk of developing endometrial cancer should have an endometrial tissue sample evaluated at menopause.

During menopause, there is a decline in the level of hormones (estrogens) normally produced by the ovaries. This causes symptoms such as "hot flashes" or thinning of the vaginal lining (the latter can make sexual intercourse painful). To control these symptoms, estrogen replacement therapy is given to women during and after menopause. This therapy increases the risk of endometrial cancer, therefore, the benefits and risks of such treatment should be carefully discussed by the woman and her physician.

Treatment: Uterine cancers generally are treated by surgery or radiation, or by a combination of the two. In precancerous (in situ) stages, changes in the cervix may be treated by cryotherapy (the destruction of cells by extreme cold), by electrocoagulation (the destruction of tissue through intense heat by electric current), or by local surgery. Precancerous endometrial changes may be treated with the hormone progesterone.

Survival: The 5-year survival rate for all cervical cancer patients is 67%. For patients diagnosed early, however, the survival rate is 88%, and if the disease is in situ, the rate is virtually 100%. In endometrial cancer, survival rates are 85% overall, 93% if discovered at an early stage, and virtually 100% if discovered at the precancerous lesion stage.

COLON AND RECTUM CANCER

Incidence: An estimated 157,500 new cases in 1991, including 112,000 of colon cancer and 45,500 of rectum cancer.

Mortality: An estimated 60,500 deaths (53,000 from colon cancer; 7,500 from rectum cancer) in 1991.

Warning Signals: Rectal bleeding, blood in the stool, change in bowel habits.

Risk Factors: Personal or family history of cancer or polyps of the colon or rectum; inflammatory bowel disease. High-fat and/or low-fiber diet may be a significant causative factor.

Early Detection: Digital rectal examination, stool blood slide test, and proctosigmoidoscopy are recommended by the American Cancer Society to detect colon or rectum cancer in asymptomatic patients.

Digital rectal examination is performed by a physician during an office visit. The American Cancer Society recommends that this examination be performed annually after age 40.

The stool blood slide test is a simple method to test feces for hidden blood. The specimen is obtained by the patient at home and returned to the physician's office, a hospital, or a clinic for analysis. The Society recommends annual testing after age 50.

In proctosigmoidoscopy, the physician uses a hollow lighted tube to inspect the rectum and lower colon. The site of most colorectal cancers appears to be shifting higher in the colon; for this reason, longer, flexible instruments are being used, as well as a rigid scope. The American Cancer Society recommends the use of this examination every 3 to 5 years after age 50, on the advice of a physician.

If any of these tests reveal possible problems, more extensive studies, such as colonoscopy (examination of the entire colon) and barium enema (an x-ray procedure in which the intestines are viewed), may be needed.

Treatment: Surgery, at times combined with radiation, is the most effective method of treating colorectal cancer. The role of chemotherapy in treating advanced cases is under study Combinations of chemotherapy and

CANCER INCIDENCE AND DEATHS BY SITE AND SEX—1991 ESTIMATES

CANCER INCIDENCE BY SITE AND SEX*

MALE	FEMALE
PROSTATE 122,000	BREAST 175,000
LUNG 101,000	COLON & RECTUM 78,500
COLON & RECTUM 79,000	LUNG 60,000
BLADDER 37,000	UTERUS 46,000
LYMPHOMA 23,800	LYMPHOMA 20,800
ORAL 20,600	OVARY 20,700
MELANOMA OF THE SKIN 17,000	MELANOMA OF THE SKIN 15,000
KIDNEY 15,800	PANCREAS 14,500
LEUKEMIA 15,800	BLADDER 13,200
STOMACH 14,500	LEUKEMIA 12,200
PANCREAS 13,700	ORAL 10,200
LARYNX 10,000	KIDNEY 9,500
ALL SITES 545,000	ALL SITES 555,000

*Excluding nonmelanoma skin cancer and carcinoma in situ.

CANCER DEATHS BY SITE AND SEX

MALE	FEMALE
LUNG 92,000	LUNG 51,000
PROSTATE 32,000	BREAST 44,500
COLON & RECTUM 30,000	COLON & RECTUM 30,500
PANCREAS 12,000	PANCREAS 13,200
LYMPHOMA 10,600	OVARY 12,500
LEUKEMIA 9,800	UTERUS 10,000
STOMACH 8,100	LYMPHOMA 9,700
ESOPHAGUS 7,300	LEUKEMIA 8,300
BLADDER 6,400	LIVER 5,800
KIDNEY 6,300	BRAIN 5,300
LIVER 6,300	STOMACH 5,300
BRAIN 6,200	MULTIPLE MYELOMA 4,500
ALL SITES 272,000	ALL SITES 242,800

immunologic agents have recently been described as beneficial in postoperative patients with known positive lymph nodes.

Colostomy (creation of an abdominal opening for elimination of body wastes) is seldom needed for colon cancer patients and is infrequently required for rectal cancer patients. One study has shown that as few as 15% of patients whose rectal cancers are detected early require permanent colostomies. The American Cancer Society has a special patient assistance program for those who do have permanent colostomies (see p. 23).

Survival: When colorectal cancer is detected in an early, localized stage, the 5-year survival rates are 88% for colon cancer and 80% for rectal cancer. After the cancer has spread regionally, to involve adjacent organs or lymph nodes, the survival rates drop to 58% and 47%, respectively. Survival rates for persons with distant metastases are less than 7%.

ORAL CANCER

Incidence: An estimated 30,800 new cases in 1991. Incidence is more than twice as high in men as in women, and is most frequent in men over age 40.

Mortality: An estimated 8,150 deaths in 1991.

Warning Signals: A sore that bleeds easily and doesn't heal; a lump or thickening; a red or white patch that persists. Difficulty in chewing, swallowing, or moving tongue or jaws are often late changes.

Risk Factors: Cigarette, cigar, or pipe smoking; use of smokeless tobacco; excess use of alcohol.

Early Detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Dentists and primary care physicians have the opportunity, during regular checkups, to see abnormal tissue changes and to detect cancer at an early, curable stage.

Treatment: Principal methods are radiation therapy and surgery. Chemotherapy is being studied as an adjunct to surgery in advanced disease.

Survival: Five-year survival rates vary substantially, depending on the site. Rates range from 32% for cancer of the pharynx to 92% for lip cancer. Overall, 5-year survival for oral cancer patients is about 52%.

BLADDER CANCER

Incidence: An estimated 50,200 new cases of bladder cancer in 1991; 37,000 in men, 13,200 in women. Bladder cancers account for 7% of the new cancer cases diagnosed each year in men and 2% in women. Bladder cancer is the fourth most common form of cancer in men and the ninth most common form of cancer in women in this country.

Mortality: An estimated 9,500 deaths in 1991 from bladder cancers, the ninth leading cause of cancer deaths in men and fourteenth in women.

Warning Signals: Blood in the urine. Usually associated with increased frequency of urination.

Risk Factors: Smoking is the greatest risk factor in bladder cancer, with smokers experiencing twice the risk of nonsmokers. Smoking is estimated to be responsible for approximately 47% of the bladder cancer deaths among men and 37% among women. Overall, the incidence rate of bladder cancer is four times greater among men than among women, and is higher in whites than in blacks. People living in urban areas and workers exposed to dye, rubber, or leather also are at higher risk.

Diagnosis: Bladder cancer is diagnosed by examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted into the tract through the urethra.

Treatment: Surgery, alone or in combination with other treatments is used in over 90% of cases. Preoperative chemotherapy alone or with radiation before cystectomy (bladder removal) has improved some treatment results.

Survival: When detected at an early stage, the 5-year survival rate for bladder cancer is 88%. For regional and distant disease the survival rates are 44% and 9%, respectively.

SKIN CANCER

Incidence: Over 600,000 cases a year, the vast majority of which are highly curable basal cell or squamous cell cancers. They are more common among individuals with lightly pigmented skin who live at latitudes near the equator. The most serious skin cancer is melanoma, which will be diagnosed in about 32,000 persons in 1991. The incidence of melanoma is increasing at the rate of 4% per year.

Mortality: An estimated 8,500 deaths this year, 6,500 from malignant melanoma and 2,000 due to other skin cancers.

Warning Signals: Any unusual skin condition, especially a change in the size or color of a mole or other darkly pigmented growth or spot. Scaliness, oozing, bleeding, or change in the appearance of a bump or nodule, the spread of pigmentation beyond its border, a change in sensation, itchiness, tenderness, or pain are all warning signs of melanoma.

Risk Factors: Excessive exposure to the sun; fair complexion; occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium. Among blacks, because of heavy skin pigmentation, skin cancer incidence is very low.

Prevention: The sun's ultraviolet rays are strongest between 10 a.m. and 3 p.m. Exposure at these times should be avoided, and protective clothing should be worn. Sunscreens should be used. These come in various strengths, ranging from those facilitating gradual tanning to those that allow practically no tanning. Because of the possible link between severe sunburn in childhood and greatly increased risk of melanoma in later life, children, in particular, should be protected from traumatic sunburns.

Early Detection: Early detection is critical. Recognition of changes in skin growths or the appearance of new growths is the best way to find early skin cancer. Adults should practice skin self-examination once a month, and suspicious lesions should be evaluated promptly by a physician. Basal and squamous cell skin cancers often take the form of a pale, waxlike, pearly nodule, or a red, scaly, sharply outlined patch. A sudden or progressive change in a mole's appearance should be checked by a physician. Melanomas often start as small, mole-like growths that increase in size, change color, become ulcerated, and bleed easily from a slight injury. A simple **ABCD** rule outlines the warning signals of melanoma: **A is for asymmetry**. One half of the mole does not match the other half. **B is for border irregularity**. The edges are ragged, notched, or blurred. **C is for color**. The pigmentation is not uniform. **D is for diameter greater than 6 millimeters**. Any sudden or progressive increase in size should be of special concern.

Treatment: There are four methods of treatment: surgery (used in 90% of cases), radiation therapy, electrodessication (tissue destruction by heat), or cryosurgery (tissue destruction by freezing) for early skin cancer. For malignant melanoma, the primary growth must be adequately excised, and it may be necessary to remove nearby lymph nodes. Removal and microscopic examination of all suspicious moles is essential. Advanced cases of melanoma are treated according to the characteristics of the case.

Survival: For basal cell or squamous cell cancers, cure is highly likely if detected and treated early. Malignant melanoma can spread to other parts of the body quickly; however, when detected in its earliest stages, and with proper treatment, it is highly curable.

The overall 5-year survival rate for white patients with malignant melanoma is 81%, compared with 95% for patients with other types of skin cancer. The 5-year survival rate for localized malignant melanoma is 90%; survival rates for regional and distant disease are 55% and 14%, respectively.

LEUKEMIA

Incidence: An estimated 28,000 new cases in 1991, approximately evenly divided into acute leukemia and chronic leukemia. Although it is often thought of as primarily a childhood disease, leukemia will strike many more adults (25,500 this year) than children (2,500 this year). Acute lymphocytic leukemia accounts for approximately 1,900 of the cases of leukemia among children. In adults, the most common types are acute granulocytic (approximately 6,500 cases annually) and chronic lymphocytic (8,200 cases annually).

Mortality: An estimated 18,100 deaths in 1991.

Warning Signals: Early signs may include fatigue, paleness, weight loss, repeated infections, bruising easily, and nosebleeds or other hemorrhages. In children, these symptoms can appear suddenly. Chronic leukemia can progress slowly and with few symptoms.

Risk Factors: Leukemia strikes both sexes and all ages. Causes of most cases are unknown. Persons with Down's Syndrome and certain other genetic abnormalities have higher than normal incidence of leukemia. It has also been linked to excessive exposure to ionizing radiation and to certain chemicals such as benzene, a toxic, commercially used substance that is also present in lead-free gasoline. Certain forms of leukemia and lymphoma are caused by a retrovirus, HTLV-1.

Early Detection: Because symptoms often appear to be those of other, less serious conditions, leukemia can be difficult to diagnose early. When a physician does suspect leukemia, diagnosis can be made using blood tests and biopsy of the bone marrow.

Treatment: Leukemia is a cancer of the bloodforming tissues. When leukemia occurs, millions of abnormal, immature white blood cells are released into the circulatory system. These abnormal cells crowd out normal white cells (which fight infection), platelets (which control hemorrhaging), and red blood cells (which prevent anemia). Chemotherapy, the most effective method of treating leukemia, kills the attacking abnormal cells. Transfusions of blood components and antibotics are used as supportive treatments. Today, continuing research at leading US medical centers is yielding new and better drugs for treating leukemia patients. Various anticancer drugs are used, either in combinations or as single agents. To prevent persistence of hidden cells, therapy of the central nervous system has become standard treatment, especially in acute lymphocytic leukemia. Under appropriate conditions, bone marrow transplantation may be useful in the treatment of certain leukemias.

Survival: The 5-year survival rate for patients with leukemia is 35%, due partly to very poor survival of patients with some types of leukemia such as acute granulocytic. Over the last 30 years, however, there has been a dramatic improvement in survival of patients with acute lymphocytic leukemia: from a 5-year survival rate of 4% for people diagnosed in the early 1960s to 28% in the early 1970s to 50% around 1980. In children, the improvement has been from 4% to 73%. The American Cancer Society has long supported leukemia-related research; in 1989 alone, grants totaled over $10 million. Over the past 11 years, more than $130 million have been awarded in such grants.

OVARIAN CANCER

Incidence: An estimated 20,700 new cases in the United States in 1991. It is estimated that one of every 70 women (approximately 1.4%) will develop ovarian cancer during her lifetime. It accounts for 4% of all cancers among women.

Mortality: An estimated 12,500 deaths in 1991. Although ovarian cancer ranks second in incidence among gynecological cancers, it causes more deaths than any other cancer of the female reproductive system.

Warning Signals: Ovarian cancer is often "silent," showing no obvious signs or symptoms until late in its development. The most common sign is enlargement of the abdomen, which is caused by the accumulation of fluid. Rarely will there be abnormal vaginal bleeding. In women over 40, vague digestive disturbances (stomach discomfort, gas, distention) that persist and cannot be explained by any other cause may indicate the need for a thorough evaluation for ovarian cancer.

Risk Factors: Risk for ovarian cancer increases with age. The highest rates are for women over 60. Women who have never had children are twice as likely to develop ovarian cancer as those who have. A number of interrelated reproductive factors, such as age at first live birth, age at first pregnancy, and number of pregnancies are all involved in varying degrees. If a woman has breast or endometrial cancer, her chances of developing ovarian cancer double. Patients with colorectal cancer are at increased risk of ovarian cancer, but risk decreases over time following diagnosis of the colorectal cancer. Certain rare genetic disorders are associated with increased risk. Incidence rates are higher in North America and northern Europe and are lower in Asia and Africa.

Early Detection: Periodic, thorough pelvic examinations are important. *The Pap test, useful in detecting cervical cancer, does not reveal ovarian cancer.* Women over the age of 40 should have a cancer-related checkup every year.

Treatment: Surgery, radiation therapy, and drug therapy are treatment options. Surgical treatment usually includes the removal of one or both ovaries (oophorectomy), the uterus (hysterectomy), and the fallopian tubes (salpingectomy). In some very early tumors, it is possible that only the involved ovary will be removed, especially in young women. In advanced disease, an attempt is made to remove all intraabdominal disease, to enhance the effect of chemotherapy.

Survival: Overall, the 5-year survival rate for ovarian cancer is 38%. If diagnosed and treated early, the relative survival rate is 85%; however, only about 24% of all cases are detected at the localized stage. Survival rates for women with regional and distant disease are 44% and 18%, respectively. Modern chemotherapeutic agents have improved the survival rate.

FIVE-YEAR SURVIVAL RATES* FOR SELECTED SITES

Selected Site	All Stages %	Local %	Regional %	Distant %
Oral	52	75	41	18
Colon-Rectum	53	85	55	6
Pancreas	3	6	4	1
Lung	13	37	13	1
Melanoma	81	90	55	14
Female Breast	75	91	69	18
Cervix Uteri	67	88	51	13
Corpus Uteri	85	93	68	26
Ovary	38	85	44	18
Prostate	71	85	74	29
Testis	88	96	91	54
Bladder	76	88	44	9

*Adjusted for normal life expectancy. This chart is based on cases diagnosed in 1974-1986.

Source: Cancer Statistics Branch, National Cancer Institute

HOW TO ESTIMATE CANCER STATISTICS LOCALLY

Community Population	Estimated No. Who Are Alive, Saved from Cancer	Estimated No. Cancer Cases Under Medical Care in 1991	Estimated No. Who Will Die of Cancer in 1991	Estimated No. of New Cases in 1991	Estimated No. Who Will Be Saved from Cancer in 1991	Estimated No. Who Will Eventually Develop Cancer	Estimated No. Who Will Die of Cancer if Present Rates Continue
1,000	13	14	2	4	2	300	220
2,000	26	28	4	8	4	600	440
3,000	39	42	6	12	6	900	660
4,000	52	56	8	16	8	1,200	880
5,000	65	70	10	20	10	1,500	1,100
10,000	130	140	20	40	20	3,000	2,200
25,000	325	350	50	100	50	7,500	5,500
50,000	650	700	100	200	100	15,000	11,000
100,000	1,300	1,400	200	400	200	30,000	22,000
200,000	2,600	2,800	400	800	400	60,000	44,000
500,000	6,500	7,000	1,000	2,000	1,000	150,000	110,000

NOTE: The figures are only a rough approximation of actual data for a community and should be used with caution. It is suggested that every effort be made to obtain actual data from a cancer registry source. Numbers may vary according to the age distribution of the local population.

Cancer by Age and Race

AFRICAN-AMERICANS

Cancer incidence and mortality rates are higher for black Americans than for white Americans. In 1987, the incidence rates were 402.5 per 100,000 for blacks and 379.1 per 100,000 for whites, about a 6% difference. Cancer mortality has increased in both races, but the change for blacks is greater than for whites. The rates were virtually the same 30 years ago. Since 1960, cancer death rates have risen 17% in white men and 2% in white women. Meanwhile, death rates have increased 51% in black men and 10% in black women.

Cancer sites where blacks have significantly higher incidence and mortality rates include esophagus, uterine cervix, stomach, liver, prostate, larynx, and multiple myeloma. Rates for esophageal cancer are over three times higher among blacks than whites.

The incidence of invasive cancer of the cervix dropped in both black and white women, although the incidence in blacks is still double that in whites. However, the rate for endometrial cancer (cancer of the body of the uterus) for white women is almost double that of black women.

Survival rates for patients diagnosed between 1981 and 1986 were compared for whites and blacks (see p. 16). More whites than blacks had cancer diagnosed in an early, localized stage when the chances of survival are best: 43% for whites versus 35% for blacks.

In a survey done for the ACS by the Gallup Organization in December 1987, the public's awareness and use of cancer screening tests was determined. The survey showed that 93% of white women knew of the Pap test and that 88% had had the test at some time, while 92% of black women knew of it and 79% had had it. For proctoscopic exams, 60% of the white population were aware of the procedure and 29% had had it at some time. For blacks, only 49% were aware of it and 22% had had it.

HISPANIC-AMERICANS

An ACS-sponsored report described Hispanic attitudes toward cancer, cancer risk reduction and early detection. The study, conducted for the Society by the firm of Clark, Martire and Bartolomeo, Inc., underscored an urgent need for extensive cancer education and information programs directed to Hispanic-Americans. Survey findings showed that Hispanic-Americans are not adequately aware of most of the warning signals of cancer or of ways to reduce cancer risk, and that they tend not to seek early detection or treatment. The study identified the key psychological, cultural and economic barriers hindering the fight against cancer in the Hispanic-American community.

THE ECONOMICALLY DISADVANTAGED

An ACS study is evaluating the association of income with knowledge, attitudes, and behaviors related to cancer, and doing this while considering the effects of other important sociodemographic variables such as age, sex, ethnicity, and education. This study will rely on data from the 1987 National Health Interview Survey Cancer Control Supplement, and will examine the role of income in determining knowledge, attitudes, and behaviors pertaining to medical care, smoking, diet, screening, and health information.

Since that study, the American Cancer Society has opened three neighborhood education/detection clinics and funded 45 community demonstration projects as part of a program targeted to this underserved population.

CHILDREN

Incidence: An estimated 7,800 new cases in 1991; as a childhood disease, cancer is rare. Common sites include the blood and bone marrow, bone, lymph nodes, brain, nervous system, kidneys, and soft tissues.

Mortality: An estimated 1,500 deaths in 1991, about one-third of them from leukemia. Despite its rarity, cancer is the chief cause of death by disease in children between the ages of 1 and 14. Mortality has declined from 8.3 per 100,000 in 1950 to 3.5 in 1987.

Early Detection: Cancers in children often are difficult to recognize. Parents should see that their children have regular medical checkups and be alert to any unusual symptoms that persist. These include: unusual mass or swelling; unexplained paleness and loss of energy; sudden tendency to bruise; persistent, localized pain or limping; prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision changes; and excessive, rapid weight loss.

Some of the main childhood cancers are:

Leukemia: See p. 13.

Osteogenic Sarcoma and *Ewing's Sarcoma* are bone cancers. These may cause no pain at first, but swelling in the area of the tumor is often a first sign.

Neuroblastoma can appear anywhere but usually in the abdomen, where a swelling occurs.

Rhabdomyosarcoma, the most common soft tissue sarcoma, can occur in the head and neck area, genitourinary area, trunk, and extremities.

Brain cancers in early stages may cause headaches, blurred or double vision, dizziness, difficulty in walking or handling objects, and nausea.

Lymphomas and *Hodgkin's Disease* are cancers that involve the lymph nodes, and also may invade bone marrow and other organs. They may cause swelling of lymph nodes in the neck, armpit, or groin. Other symptoms may include general weakness and possibly fever.

Retinoblastoma, or an eye cancer, usually occurs in children under the age of four. When detected early, cure is possible with appropriate treatment.

Wilms' tumor, a kidney cancer, may be recognized by a swelling or lump in the abdomen.

Treatment: Childhood cancers can be treated by a combination of therapies, coordinated by a team of experts. They include oncologic physicians, pediatric nurses, social workers, psychologists, and others who assist children and their families.

Survival: Five-year survival rates vary considerably, depending on the site. Among those for white children: all sites 67%; bone cancer, 54%; neuroblastoma, 56%; brain and central nervous system, 59%; Wilms' tumor (kidney), 83%; and Hodgkin's disease, 85%. (Data are not available for other ethnic groups.)

TRENDS IN SURVIVAL BY SITE OF CANCER, BY RACE
Cases Diagnosed in 1960-63, 1970-73, 1974-76, 1977-80, 1981-86

SITE	WHITE					BLACK				
	RELATIVE 5-YEAR SURVIVAL					RELATIVE 5-YEAR SURVIVAL				
	1960-63[1]	1970-73[1]	1974-76[2]	1977-80[2]	1981-86[2]	1960-63[1]	1970-73[1]	1974-76[2]	1977-80[2]	1981-86[2]
All Sites	39%	43%	50%	50%	52%*	27%	31%	39%	39%	38%
Oral Cavity & Pharynx	45	43	55	54	53	–	–	35	34	31
Esophagus	4	4	5	6	9*	1	4	4	4	6
Stomach	11	13	14	16	16*	8	13	16	16	18
Colon	43	49	50	53	57*	34	37	46	48	48
Rectum	38	45	49	51	54*	27	30	41	37	41
Liver	2	3	4	3	5	–	–	1	3	4
Pancreas	1	2	3	2	3*	1	2	2	5	4
Larynx	53	62	66	67	69*	–	–	59	58	52
Lung & Bronchus	8	10	12	13	13*	5	7	11	12	11
Melanoma of Skin	60	68	80	81	81*	–	–	69†	49‡	65
Breast (female)	63	68	75	75	78*	46	51	63	63	64
Cervix Uteri	58	64	69	68	67	47	61	63	62	57*
Corpus Uteri	73	81	89	86	84*	31	44	62	56	55
Ovary	32	36	36	37	39*	32	32	41	39	38
Prostate Gland	50	63	67	72	75*	35	55	58	62	62*
Testis	63	72	78	88	92*	–	–	77†	73†	92
Urinary Bladder	53	61	73	76	79*	24	36	47	54	59*
Kidney & Renal Pelvis	37	46	52	51	53	38	44	49	56	51
Brain & Nervous System	18	20	22	24	24*	19	19	28	28	32
Thyroid Gland	83	86	92	92	94	–	–	87	92	96
Hodgkin's Disease	40	67	71	73	76*	–	–	68	73	74
Non-Hodgkin's Lymphoma	31	41	47	49	51*	–	–	48	49	45
Multiple Myeloma	12	19	24	25	26*	–	–	28	32	28
Leukemia	14	22	34	36	36	–	–	30	29	29

Source: Cancer Statistics Branch, National Cancer Institute.

[1] Rates are based on End Results Group data from a series of hospital registries and one population-based registry.

[2] Rates are from the SEER Program. They are based on data from population-based registries in Connecticut, New Mexico, Utah, Iowa, Hawaii, Atlanta, Detroit, Seattle-Puget Sound and San Francisco-Oakland. Rates are based on follow-up of patients through 1986.

*** The difference in rates between 1974-76 and 1981-86 is statistically significant ($p < 0.05$).**

† The standard error of the survival rate is greater than 10 percentage points.

‡ The standard error of the survival rate is between 5 and 10 percentage points.

– Valid survival rate could not be calculated.

Prevention

	AVOID THOSE FACTORS THAT MIGHT LEAD TO THE DEVELOPMENT OF CANCER. (PRIMARY PREVENTION)
SMOKING	Cigarette smoking is responsible for 85% of lung cancer cases among men and 75% among women—about 83% overall. Smoking accounts for about 30% of all cancer deaths. Those who smoke two or more packs of cigarettes a day have lung cancer mortality rates 15 to 25 times greater than nonsmokers.
SUNLIGHT	Almost all of the more than 600,000 cases of basal and squamous cell skin cancer diagnosed each year in the US are considered to be sun-related. Epidemiologic evidence shows that sun exposure is a major factor in the development of melanoma and that the incidence increases for those living near the equator. (See Selected Cancer Sites: Skin Cancer.)
ALCOHOL	Oral cancer and cancers of the larynx, throat, esophagus, and liver occur more frequently among heavy drinkers of alcohol. (See Selected Cancer Sites: Oral Cancer.)
SMOKELESS TOBACCO	Use of chewing tobacco or snuff increases risk of cancer of the mouth, larynx, throat, and esophagus and is highly habit-forming. (See Selected Cancer Sites: Lung Cancer and Oral Cancer.)
ESTROGEN	Estrogen treatment to control menopausal symptoms increases risk of endometrial cancer. Use of estrogen by menopausal women needs careful discussion by the woman and her physician. (See Selected Cancer Sites: Uterine Cancer.)
RADIATION	Excessive exposure to ionizing radiation can increase cancer risk. Most medical and dental x-rays are adjusted to deliver the lowest dose possible without sacrificing image quality. Excessive radon exposure in homes may increase risk of lung cancer, especially in cigarette smokers. If levels are found to be too high, remedial actions should be taken.
OCCUPATIONAL HAZARDS	Exposure to several different industrial agents (nickel, chromate, asbestos, vinyl chloride, etc.) increases risk of various cancers. Risk from asbestos is greatly increased when combined with cigarette smoking.
NUTRITION	Risk for colon, breast, and uterine cancers increases in obese people. High-fat diets may contribute to the development of cancers of the breast, colon, and prostate. High-fiber foods might help reduce risk of colon cancer. A varied diet containing plenty of vegetables and fruits rich in vitamins A and C may reduce risk for a wide range of cancers. Salt-cured, smoked, and nitrite-cured foods have been linked to esophageal and stomach cancer. The heavy use of alcohol, especially when accompanied by cigarette smoking or chewing tobacco, increases risk of cancers of the mouth, larynx, throat, esophagus, and liver.
	ACTIONS TO DIAGNOSE A CANCER OR PRECURSOR AS EARLY AS POSSIBLE (SECONDARY PREVENTION/EARLY DETECTION).
COLORECTAL TESTS	The American Cancer Society recommends three tests for the early detection of colon and rectum cancer in people without symptoms. A digital rectal examination by a physician during an office visit, should be performed every year after the age of 40; the stool blood test is recommended every year after 50; and the proctosigmoidoscopy examination should be carried out every 3 to 5 years, based on the advice of a physician. (See Selected Cancer Sites: Colon and Rectum Cancer.)
PAP TEST	For cervical cancer, women who are or have been sexually active, or have reached age 18 years, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.
BREAST CANCER DETECTION	The American Cancer Society recommends the monthly practice of breast self-examination (BSE) by women 20 years and older as a routine good health habit. Physical examination of the breast should be done every three years from ages 20-40 and then every year. The ACS recommends a mammogram every year for asymptomatic women age 50 and over, and a baseline mammogram between ages 35 and 39. Women 40-49 should have mammography every 1-2 years, depending on physical and mammographic findings.

CANCER-RELATED CHECKUP GUIDELINES

Guidelines for the early detection of cancer in people without symptoms are recommended by the American Cancer Society as follows:

A cancer-related checkup:

- every 3 years for those 20-40 years of age.
- every year for those 40 and over.

The Society advises that you talk with your doctor. Ask how the guidelines apply to you. The checkup should always include health counseling (such as tips on quitting smoking) and examinations for cancer of the thyroid, testes, prostate, mouth, ovaries, skin, and lymph nodes.

In particular:

- Ages 20-40—For breast cancer, an examination by a physician every three years, a self-exam every month, and one baseline breast x-ray between the ages of 35 and 39. For cervical cancer, women who are or have been sexually active, or have reached age 18, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.
- Ages 40 and over—For breast cancer, a professional exam every year, a self-exam every month, and a breast x-ray every 1-2 years for those 40-49; every year for those 50 and over. For cervical cancer, women who are or have been sexually active, or have reached age 18 years, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician. For women at high risk, an endometrial tissue sample should be taken at menopause. For colon and rectum cancer, a digital rectal exam every year after 40, and a stool blood test every year after 50, and a sigmoidoscopic exam every 3-5 years.

Some people are at higher risk for certain cancers and may need tests more frequently. (See pp. 8-13 for high risk factors.)

COLORECTAL CANCER: EARLY DETECTION IS THE KEY

Currently, about 157,500 new cases of colorectal cancer are diagnosed each year; about 60,500 people will die from the disease in 1991. The incidence of colorectal cancer tends to increase with age, starting at 40 years. More than 94% of all cases occur after the age of 50. Colorectal cancer occurs about equally in both sexes. Anyone with a personal or family history of colorectal cancer, polyps in the colon, or inflammatory bowel disease is at particularly high risk for the disease and should be examined carefully. Evidence suggests that bowel cancer may be linked to a diet high in fat and/or low in fiber content.

Because colorectal cancer develops over a period of time, detection of the disease is possible long before symptoms appear. Early detection of small cancers and polyps reduces the likelihood of major surgery and the need for a colostomy (an abdominal opening created for the elimination of wastes). In fact, permanent colostomies are rare in cases of colon cancer, and are necessary in only 15% of rectal cancer cases.

When cancer of the colon and rectum is found and treated in an early, localized stage, the 5-year survival rate is 88% for colon cancer and 80% for rectal cancer. However, survival figures drop to 58% and 47%, respectively, after the cancer has started to spread regionally.

With early detection techniques, such as the digital rectal exam, the stool blood test, and sigmoidoscopy, and with appropriate management, about 50,000 more of those diagnosed this year could be saved.

It is recommended that the following procedures, all part of a cancer-related checkup, be performed at designated intervals:

- A digital rectal examination every year after age 40.
- A stool blood test every year after age 50.
- A sigmoidoscopy every three to five years after the age of 50.

These guidelines apply *only* to people without symptoms. Persons with rectal bleeding, cramping abdominal pain, or a change in bowel habits should see their physicians immediately.

A 1987 study of men and women age 40 and over, conducted for the Society by the Gallup Organization, revealed a number of important findings concerning Americans' attitudes toward detection measures for colorectal cancer. There has been some increase in public awareness of the 3 tests recommended to detect the disease, but there is much room for improvement. The study found, for instance, that the percentage of Americans who ever had a digital rectal examination increased slightly since 1983, from 51% to 56%. Likewise, the percentage of Americans who ever had a stool blood test rose, from 28% in 1983 to 40% in 1987. And while the percentage of men and women 50 and over who ever had a proctoscopic examination rose from 31% in 1983 to 42% in 1987, 60% of Americans who should have had the examination (according to Society guidelines) had not had it.

The survey also showed that 24% of those individuals in the 40-plus age group have ever asked their doctor to examine their colon or rectum. And of this group, more than half did so only because something was bothering them.

On the promising side, the survey showed that almost 50% of all Americans would be interested in learning more about this form of cancer.

BREAST CANCER: A PROGRAM OF ACTION

About one of every 9 women in the United States will develop breast cancer during her lifetime. Until the disease can be prevented, the best way women can protect themselves is through early detection and prompt treatment. Today, with modern technologies, breast cancer can be detected at very early stages of development, when the chance of cure is highest.

The risk of breast cancer increases as a woman grows older, and certain genetic and lifestyle conditions may increase risk further. These include a history of breast cancer in a close family relative, giving first birth after age 30, never giving birth, and obesity (body weight 40% above normal).

The American Cancer Society recommends that women develop a three-part, personal plan of action, in cooperation with their doctors, for early detection of breast cancer. (See p. 18 for Checkup Guidelines.)

A **clinical breast exam** should be performed by a doctor as part of a regular health checkup. This includes a visual inspection of the breasts, looking for changes in shape or size or skin dimpling, followed by a thorough inspection of the breast, chest and armpits. Women should ask their doctors how often they should have a clinical breast exam.

A **mammogram** is a low-dose breast x-ray that can identify cancers too small to be felt. The Society guidelines for recommended frequency should be followed (see p. 17) in accordance with age and health history. Recent improvements have reduced the amount of radiation necessary for high-quality mammograms.

The Society recommends that all women over the age of 20 perform **breast self-examination** (BSE) once a month. BSE is important because breast cancer symptoms may develop and be found between clinical breast exams or mammography. Through regular BSE, women become familiar with their breasts; thus changes are more likely to be noticed.

TOBACCO USE

Smoking is the most preventable cause of death in our society. Tobacco use is responsible for more than one in six deaths in the United States. Based upon data from the Cancer Prevention Study II (CPS II), it is estimated that smoking is related to about 400,000 US deaths each year. According to the World Health Organization, approximately 2.5 million people die worldwide each year as a result of smoking.

The American Cancer Society estimates that cigarette smoking is responsible for 85% of lung cancer deaths among men and 75% among women—about 83% overall. This reflects the fact that in the past, more men than women smoked, and smoked more heavily. However, the gap between the numbers of men and women smoking has been narrowing.

Smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, uterine cervix, kidney and bladder. Smoking accounts for 30% of all cancer deaths, is a major cause of heart disease, and is associated with conditions ranging from colds and gastric ulcers to chronic bronchitis, emphysema, and cerebrovascular disease.

A Decline in Smoking

The 1989 Surgeon General's Report, which covers the 25 years of progress since the first Surgeon General's Report on Smoking and Health in 1964, reports that the prevalence of smoking has decreased from 40% in 1965 to 29% in 1987. Between 1964 and 1985, approximately three-quarters of a million smoking-related deaths were avoided or postponed as a result of decisions to quit smoking or not to start.

From 1976 to 1987, adult male smokers (20 years and older) dropped from 42% of the population to 32%, while women smokers decreased from 32% to 27%. A survey supported by the National Institute on Drug Abuse indicated that the percentage of high school seniors (aged 17 and 18) who smoked cigarettes daily decreased from 29% in 1976 to 18% in 1988.

It is now estimated that in the United States today there are about 38 million excigarette smokers and about 50 million smokers. Smoking rates are higher among blacks, blue-collar workers, and less-educated people. Children (especially girls) are starting to smoke at earlier ages. More than 3,000 teenagers become regular smokers each day in the United States. At the same time, however, the average smoker appears to be smoking more heavily. The proportion of adult male smokers (20 years and older) consuming 25 or more cigarettes per day increased from 30.7% to 32% between 1976 and 1985, and female smokers from 19% to 21%.

Per capita cigarette consumption among adults has fallen—from 4,141 in 1974 to 2,936 in 1989—reflecting a growing number of exsmokers. This is the lowest per capita consumption since 1942.

A September 1985 study by the US Congress Office of Technology Assessment estimates the cost of smoking to the economy from $38 billion to $95 billion with a middle estimate of $65 billion. This amounts to $2.17 in lost productivity and the treatment of smoking-related diseases for each pack of cigarettes sold.

A June 1989 tobacco report of the US Department of Agriculture estimates US cigarette output from July 1988 to June 1989 at 685 billion, down 3% from the period July 1987 to June 1988. Figures from the USDA show that 542 billion cigarettes were consumed in 1989, down from 563 billion in 1988. However, US cigarette exports have increased 130% since 1985.

Nicotine Addiction

The Surgeon General released a report on nicotine addiction in May 1988. The report points out that all tobacco products contain substantial amounts of nicotine. Nicotine is absorbed readily from tobacco smoke in the lungs and from smokeless tobacco in the mouth or nose, and is rapidly distributed throughout the body.

The conclusions were:
1) cigarettes and other forms of tobacco are addicting; 2) nicotine is the drug in tobacco that causes addiction; and 3) the pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

Smoking Cessation

In September 1990, the Surgeon General released a report showing that people who quit smoking, regardless of age, live longer than people who continue to smoke. Smokers who quit before age 50 have one-half the risk of dying in the next 15 years compared with those who continue to smoke.

According to a 1989 Gallup survey, 57% of smokers 50 and older, 68% of smokers aged 18-29, and 67% of smokers aged 30-49 want to quit smoking.

The proportion of smokers who predict that they will be smoking in 5 years has decreased from 75% in 1964 to less than 50% in 1986.

The report states that "smoking cessation has major and immediate health benefits for men and women of all ages." Quitting smoking substantially decreases the risks of lung, laryngeal, esophageal, oral, pancreatic, bladder, and cervical cancer.

The benefits of cessation include risk reduction for other major diseases including coronary heart disease and cardiovascular disease.

Involuntary Smoking Hazards

There are hazards for nonsmokers who breathe the smoke of others' cigarettes. Several scientific studies, including a 1985 study by the American Cancer Society, have found an increased risk of lung cancer among nonsmoking wives of cigarette smokers.

Two major reviews in 1986 by the Surgeon General and the National Academy of Sciences state that involuntary smoking is a health hazard.

Smokeless Tobacco

There has been a recent resurgence in the use of all forms of smokeless tobacco—plug, leaf, and snuff—but the greatest cause for concern centers on the increased use of "dipping snuff." In this practice, tobacco that has been processed into a coarse, moist powder is placed between the cheek and gum, and nicotine, along with a number of other carcinogens, is absorbed through the oral tissue. "Dipping snuff" is a highly addictive habit, one that exposes the body to levels of nicotine equal to those of cigarettes. A 1986 report of the Advisory Committee to the Surgeon General, outlining the health consequences of smokeless tobacco use, concluded that there is strong scientific evidence that the use of snuff causes cancer in humans, particularly cancer of the oral cavity. Oral cancer occurs several times more frequently among snuff dippers compared with non-tobacco users, and the excess risk of cancer of the cheek and gum may reach nearly fifty-fold among long-term snuff users. Smokeless tobacco is becoming a problem large in scope; the report found that in 1985 smokeless tobacco was used by at least 12 million people in the United States, and half of these were regular users. The use of smokeless tobacco is increasing among male adolescents and young male adults.

Industrial Hazards

Industrial workers are especially susceptible to lung diseases due to the combined effects of cigarette smoking and exposure to toxic industrial substances, such as fumes from rubber and chlorine, and dust from cotton and coal. Exposure to asbestos in combination with cigarette smoking increases an individual's lung cancer risk nearly 60 times.

CANCER RISK ASSESSMENT

Cancer risk assessment is essential to create the standards and practices which protect people against unsafe exposures to radiation and chemicals. The assessment process requires information about: 1) the toxic properties of a potentially oncogenic substance and 2) the extent to which human exposure occurs. The first step is to identify the hazard, its chemical structure or physical nature and its toxic properties when tested under laboratory conditions in animals or cell systems. Toxicity is then investigated further in terms of dose-response relationships, the manner in which toxic effects increase with dose of toxin.

Exposure assessment involves: 1) measuring the concentration of the material in the environment to which people are potentially exposed (air, water, food, medications, workplace) and 2) measuring the extent to which people are actually exposed (how much they eat of a particular food product, use a particular medication, etc.) This information, together with knowledge of the pathways by which the toxin is absorbed, metabolized, and excreted in the body, provides an evaluation of exposure which, coupled with the evaluation of toxicity, results in the eventual risk assessment.

For most potential carcinogens, risk assessment involves two stages at which extrapolation of information is required: extrapolation of observed animal toxicity to what might be expected in humans and extrapolation of effects seen at high doses to what might be expected at low doses. In both procedures, conservative assumptions are made (for example, a linear no-threshold model for extrapolating low-dose effects) so that if the eventual risk assessment is in error, it will have erred on the side of safety. For cancer risk estimations, only risk levels of one case per million persons per lifetime or smaller are usually accepted.

From this process of risk assessment, safety standards for chemical or radiation exposures are developed, and they form the basis for the regulatory activities of such federal agencies as the Food and Drug Administration, Environmental Protection Agency, and Occupational Safety and Health Administration. The development of laws and procedures by which risks are eliminated or controlled is termed "Risk Management."

NUTRITION AND CANCER: A COMMON SENSE APPROACH

Evidence indicates that people might reduce their cancer risk by observing these guidelines:

1. Avoid obesity. Individuals 40% or more overweight increase their risk of colon, breast, prostate, gallbladder, ovary, and uterine cancers. Physicians can recommend a suitable diet and exercise regimen to help maintain an appropriate weight.

2. Cut down on total fat intake. A diet high in fat may be a factor in the development of certain cancers, particularly breast, colon, and prostate.

3. Include a variety of vegetables and fruits in the daily diet. Such foods contain mainy constituents that may have cancer prevention activity. These include vitamins A and C in dark green and deep yellow fresh vegetables and in many fruits as well as cruciferous vegetables such as cabbage, broccoli, and cauliflower.

4. Eat more high-fiber foods such as whole grain cereals, breads, and pasta; vegetables and fruits. High-fiber diets may reduce risk of colon cancer. Such diets offer a healthy substitute for fatty foods.

5. Limit consumption of alcohol, if you drink at all. The heavy use of alcohol, especially when accompanied by cigarette smoking or smokeless tobacco use, increases risk of cancers of the mouth, larynx, throat, esophagus, and liver.

6. Limit consumption of salt-cured, smoked, and nitrite-cured foods. In areas of the world where salt-cured and smoked foods are eaten frequently, there is more incidence of cancer of the esophagus and stomach. The American food industry has developed new processes to avoid possible cancer-causing byproducts.

CANCER AND THE ENVIRONMENT

Most cancer cases in the United States are believed to be environmentally related, that is, associated in some way with our physical surroundings, personal habits, or lifestyles.

Occupational hazards, especially ionizing radiation and chemicals like asbestos and vinyl chloride, have been closely studied and are under continuing surveillance. Workplace exposures, however, account for only a small percentage of all cancers.

Some environmental causes of cancer are well known. About 30% of all cancer deaths are directly related to the use of tobacco.

Other causes are harder to assess. Diet is suspected as an important element in cancer risk, some say causing perhaps 35% of all cancer deaths. There is much research underway on the role diet and nutrition play in the development of cancer.

To help identify environmental factors in human cancer, the American Cancer Society has undertaken a two-part program of environmental cancer research. This involves Cancer Prevention Study II (CPS II), an epidemiologic study to examine the relationship of environment and lifestyle to cancer development; and support of extramural cancer cause and prevention research projects.

The American Cancer Society's Cancer Prevention Study II

One of the largest research studies ever carried out in the United States was launched in 1982. CPS II, a long-term prospective study, is examining the habits and exposures of more than one million Americans to learn how lifestyles and environmental factors affect the development of cancer.

Modeled after the first Cancer Prevention Study (1959-72), CPS-II is similar in method but wider in scope and involves more participants.

Over 77,000 volunteers enrolled 1.2 million men and women in the study. These volunteer researchers distributed a four-page confidential questionnaire to participants who were asked about their exposures to certain environmental conditions, their history of disease, and their lifestyles.

Many of the questions focus on health issues of current concern. These include risks of certain drugs, foods, and various occupational exposures; low-tar and low-nicotine cigarettes; consumer products; long-term exposure to low-level radiation; and the health effects associated with air and water pollution.

The goal of the study is to identify those factors that increase a person's chances of developing cancer, those that carry little or no risk, and those that actually may help prevent cancer, by comparing mortality rates of differently exposed groups.

Numerous papers have been published from the analyses of data on the original questionnaires and followup reports. One showed massive changes in American smoking habits compared with 23 years earlier in CPS I. Among men, 24% smoked, half as many as in the earlier study. More than twice as many had quit cigarette smoking. Another paper showed that the percentage of physicians who smoke is now down to 16%, and is about 14% in dentists and 23% in nurses. It was found that death rates from all causes were 81% higher in obese and underweight people than those of average weight and that degree of exercise was negatively correlated with cancer death rates. A paper on smoking in women showed that smokers die of lung cancer at a rate 12 times that of nonsmokers. Another study describes an increased risk of myeloid leukemia among men who smoke.

Since CPS I, new factors in our environment have been identified that may be related to cancer. The Society decided to initiate CPS II to respond to the concerns of the public and scientific community about suspected carcinogens.

Without the use of our volunteers, the cost of carrying out CPS II would total more than $100 million. With volunteers to collect the data, the study has cost only about $9 million in its first eight years.

The American Cancer Society

PROFILE

The Society traces its origins to 1913, when a group of ten physicians and five laymen met in New York City and founded the American Society for the Control of Cancer. Its stated purpose at the time was to "disseminate knowledge concerning the symptoms, treatment, and prevention of cancer; to investigate conditions under which cancer is found; and to compile statistics in regard thereto." Later renamed the American Cancer Society, it is today one of the oldest and largest voluntary health agencies in the United States, comprised of 2.5 million Americans united to conquer cancer through balanced programs of research, education, patient service, and rehabilitation.

Organization: The American Cancer Society, Inc. is composed of a National Society, with 57 chartered Divisions and over 3,300 Units.

The National Society: A 206-member House of Delegates provides a basic representation from the 57 Divisions and additional representation on the basis of population. It elects and is governed by a Board of Directors of 124 voting members, half of whom are members of the medical or scientific professions.

The National Society is responsible for overall planning and coordination, provides technical help and materials to Divisions and Units, administers programs of research, medical grants and clinical fellowships, and carries out public and professional education on the national level.

The 57 Divisions: These are governed by members of Divisional Boards of Directors, both medical and lay, in all the states plus five metropolitan areas, the District of Columbia and Puerto Rico.

The Units: These are organized to cover the counties in the United States. There are thousands of community leaders who direct the Society's programs at this level.

The Programs: The Society maintains its priorities and goals through activities developed by the departments of Research, Professional Education, Public Education, Public Information, Communications, Epidemiology and Statistics, Service and Rehabilitation, Public Affairs, and Crusade/Income Development.

PUBLIC EDUCATION

The American Cancer Society's Public Education programs are designed to inform people about cancer, tell them what they can do to protect themselves, and demonstrate related health habits.

The programs focus on two areas: cancer prevention which includes smoking control and the relationship between diet, nutrition, and cancer; and the importance and value of periodic, cancer-related checkups and specific early cancer detection tests. Prompt action if one of cancer's seven warning signals occurs is also encouraged.

Six cancer sites account for the majority of cancer cases and about half of cancer deaths—colon and rectum, lung, breast, uterus, oral cavity, and skin. The Society's Public Education planning strategy emphasizes programs where prevention, risk reduction, and early detection practices realize the greatest return in terms of lives saved.

The Society's Public Education programs are divided into two categories: adult and youth. Adults are reached through the worksite, healthsite, and community in small group settings or on a one-to-one basis. Whenever possible, volunteers are selected on the basis of skills that can be readily adapted to Public Education. Volunteers include exsmokers with group experience who can help in smoking cessation programs, and health professionals who can teach breast self-examination to groups of women.

Youth programs are usually conducted as part of a comprehensive health education program in the schools. The programs are organized according to grade level and provide an age-appropriate message. These messages will affect cancer risk significantly through strategies designed to teach young people to adopt good health habits, to make health-enhancing lifestyle decisions, and, to understand health behavior as it relates to cancer risk reduction.

Last year, the American Cancer Society's nationwide Public Education programs reached 26 million adults and 29 million young people.

Programs on nutrition, tobacco, and breast health are the highest current priorities in Public Education. Recently released nutrition programs include Eating Smart for adults and Changing The Course for youth. Tobacco-related programs for adults include Smart Move, Special Delivery for pregnant women who smoke, and an involuntary tobacco program entitled, Where There's No Smoke. The program Special Touch is available to emphasize the importance of the early detection of breast cancer.

PROFESSIONAL EDUCATION

The Society's Professional Education Department provides health care professionals with the latest information on developments in cancer prevention, early detection, and treatment through national conferences and workshops, audiovisual and print publications, and clinical awards, professorships, and scholarships. Through a network of volunteers who are leaders in the fields of medicine, nursing, social work, dentistry, and other health care disciplines, the Society offers state-of-the-art information on cancer control with the ultimate goal of offering the American public the best possible opportunity to prevent cancer from occurring, to detect it early when it does occur, and to treat it with the best available technology.

Conferences and Workshops

The Professional Education Department offers continuing medical education to physicians and other health care professionals through national conferences and workshops in which leaders in the field of cancer control present the latest information on various preventive strategies, diagnostic techniques, and therapies. The American Cancer Society is accredited by the Accreditation Council for Continuing Medical Education to sponsor continuing medical education. Attendance at these national conferences frequently qualifies for continuing education credits for other disciplines as well.

Audiovisuals, Journals, and Other Publications

Videotapes, slide programs, audiotapes, text books, proceedings of conferences and workshops, booklets on key issues and treatments are examples of the publications the Society offers health care professionals to keep them up to date on the latest developments in cancer care. Emphasis is placed on strategies to prevent cancer and methods for detecting it in its earliest stages.

The Society publishes two national journals for health care professionals, *Ca-A Cancer Journal for Clinicians* and *Cancer*, a journal for those specializing in cancer research and in the care of the cancer patient.

Exhibits at National Health Care Meetings

To make health care professionals aware of the publications and services that the Society offers, the Professional Education Department exhibits at national meetings of health care organizations. Through these exhibits, physicians, nurses, and other practitioners can see books, pamphlets, and audiovisuals first hand and learn about continuing education offerings and clinical awards.

Clinical Awards

Leading experts in oncology are supported to promote cancer education in medical, dental, and other appropriate schools through the Professors of Clinical Oncology award. Since the award's inception in 1970, the Society has funded fifty-nine professors.

The National Clinical Awards Program was established in 1948 to provide broad support for oncology training at qualified hospitals and institutions. Over the past 40 years, Regular Clinical Fellowships and Junior Faculty Clinical Fellowships have had considerable impact on training physicians and dentists in oncology specialties, supporting the education of more than 9,600 individuals. Currently, funds are provided via the Clinical Oncology Fellowship (COF) and Clinical Oncology Career Development Award (CDA). The COF provides unique training opportunities for fellows to expand their expertise in oncology. The CDA is awarded to outstanding individuals who intend to pursue an academic career in oncology.

Through the Oncology Social Work Award, the Society offers traineeships for oncology social workers committed to research and clinical practice with cancer patients and their families. Each year awards are made to 24 master's and four post-master's candidates.

A new award program for primary care physicians was created in 1990. The Cancer Control Career Development Award is intended for family and general practice physicians who will serve as leaders in teaching, research, and clinical practice. Beginning in July 1990, three physicians were each awarded a total of $55,000 stipend support over the two years of the grant.

Nursing Programs

Cancer Nursing News, a free newsletter for nurses, provides up-to-date information on cancer, oncology nursing, the American Cancer Society, and opportunities in continuing education. Requests for subscriptions should be sent to the Executive Editor, *Cancer Nursing News*, c/o American Cancer Society, 1599 Clifton Road, N.E., Atlanta, GA 30329.

Twenty new scholarships are awarded each year to qualified graduate students studying for a master's degree with a specialty in oncology nursing. Scholarships are $8,000 a year for up to two years based on the student's continuing progress in the graduate program.

Professorships in oncology nursing are offered through the chartered Divisions of the Society. These professorships enhance the quality of care of cancer patients by increasing the focus on cancer education in schools of nursing.

Questionable Methods of Cancer Management

The Society monitors and maintains information on unproven methods of cancer management. Information on such questionable treatments is closely reviewed by a committee of volunteer health care professionals, which periodically issues carefully researched position statements on these various "unconventional" treatments. These position statements are available to physicians, science writers, editors, and the general public.

SERVICE AND REHABILITATION

In 1990, approximately 665,000 cancer patients were reached through the innovative service and rehabilitation programs of the American Cancer Society.

Service Programs

Resources, Information, and Guidance Services. Specific information about cancer is provided, as well as referral to Society services and other resources in the community to meet the social, psychological, and home care needs of cancer patients and their families.

Home Care Items. This program provides necessary, useful home care supplies, and equipment for the comfort of the patient.

Transportation. Volunteer drivers provide transportation that enables patients to maintain their medical and continuing care programs.

Rehabilitation Programs

CanSurmount. This is a short-term visitor program for cancer patients and their families. Hospital and home visits are made with the approval of the physician. The one-to-one visit by a person who has experienced the same type of cancer offers functional, emotional, and social support.

Reach to Recovery. This program, the largest of the Society's patient-visitor programs, addresses the physical, emotional, and cosmetic needs of women who have or have had breast cancer. Carefully selected and trained volunteer visitors provide support and information, with the approval of the attending physician. In addition, literature and services to help husbands, children, and friends of breast cancer patients are available.

Laryngectomy Rehabilitation. Spearheaded by the International Association of Laryngectomees (IAL), this program is coordinated through more than 275 clubs. Laryngectomee visitors provide pre- and/or postoperative support to patients who undergo removal of the larynx.

Ostomy Rehabilitation. Some patients with intestinal or urinary cancers must have abdominal ostomies (surgically constructed openings for elimination of body wastes). Trained volunteers who have experienced this same type of surgery offer help on a one-to-one basis. Cooperating with the United Ostomy Association and enterostomal therapists, patients are assisted in their physical and psychological adjustment.

Patient and Family Education Programs

The Society sponsors group and individual education programs, distributes pamphlets and booklets and provides audiovisual presentations for patients of all ages and their families to help them understand and deal with the complexities of the disease.

I Can Cope. Information is provided on cancer and its treatments, nutrition, resource availability, and other issues of concern to cancer patients and their families.

Look Good... Feel Better. This program is an opportunity for people undergoing cancer treatment to develop skills to improve their appearance. A program in partnership with the Cosmetic, Toiletry and Fragrance Association and the National Cosmetology Association, it focuses on cosmetic techniques that can help people cope with body changes resulting from cancer treatment.

COSTS OF CANCER

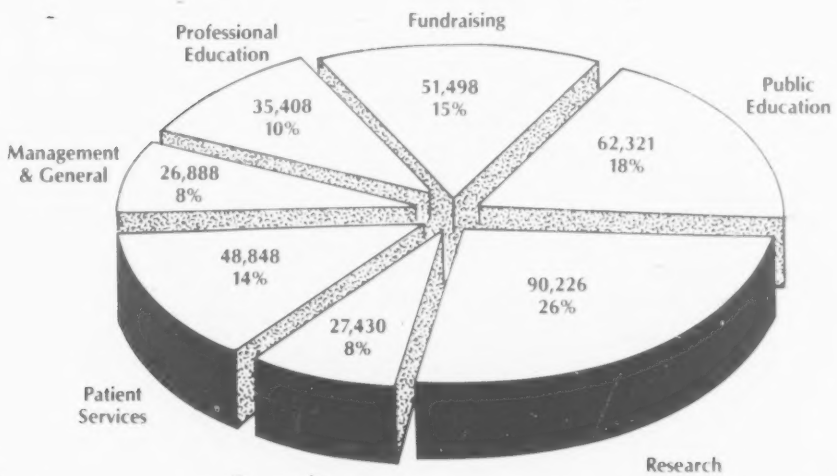
A study from the National Cancer Institute puts overall costs for cancer at $104 billion for 1990; $35 billion for direct medical costs; $12 billion for morbidity costs (cost of lost productivity), and $57 billion for mortality costs.* Earlier figures showed that cancer accounts for 10% of the total cost of disease in the US and that its share of the total cost of premature death was about 18% of all causes of death in 1985.

The cost of detection activities, including mammograms, Pap smears, and colorectal screenings adds another 3 to 4 billion dollars to overall cancer costs.

Individuals have several sources of help in paying for cancer costs: third-party payers such as Blue Cross and private insurance companies, public agencies (Medicare), and private health organizations. Cancer is covered by personal insurance plans either under narrowly defined cancer policies or through catastrophic illness provisions in comprehensive insurance programs.

*Brown, ML: Special Report: The national economic burden of cancer: an update. JNCI 1990; 82:1811-1814.

ALLOCATION OF AMERICAN CANCER SOCIETY FUNDS



Based on
Total 1989-90 Budget
$343,619

Figures taken from
1989 Annual Report
(in thousands)

RESEARCH

The aim of the Society's research program is to determine, as quickly as possible, the causes, prevention, and cure of cancer. Research requires highly trained personnel, laboratory facilities, and supplies for each project—all are resources that cost money. The American Cancer Society is the largest source of private cancer research funds in the United States, second only to the National Cancer Institute, an agency of the federal government.

The Society's overall investment in research has grown steadily from $1 million in 1946 to more than $80 million this year. The sum represents slightly over 25% of the total expenditures of the Society. To date, the Society has invested more than $1.3 billion in cancer research. Twenty-five Nobel Prize winners have received grant support from the American Cancer Society.

The research program focuses primarily on investigator-initiated projects, rather than directed research undertaken on a contract basis. With the exception of staff and facilities to carry out its epidemiologic studies, the American Cancer Society neither hires staff researchers nor operates its own laboratories. This gives the Society the freedom to place its grants in leading medical centers and other scientific institutions across the country, where the most innovative and promising ideas are being explored. In this way there is a minimum of overhead and a maximum of flexibility to make sure that research money has the highest probability of yielding results that will benefit people.

Applications for American Cancer Society grants are subjected to a rigorous process of evaluation, beginning with careful study by the appropriate one of 13 scientific review committees and then by two additional groups of experts, before being given final approval by the National Board of Directors.

Types Of Grants

The Society's research program is diverse in concept and recipients. Overall, the program offers five major types of grants: (1) Research and Clinical Investigation Grants to finance investigator-initiated research; (2) Research Personnel Grants to provide salary support, both for established scientists and for postdoctoral fellows specializing or planning to specialize in cancer research; (3) Institutional Research Grants to universities, institutes, and hospitals to support pilot studies and the work of young investigators in cancer; (4) Research Development Program Grants to provide rapid funding for priority projects; and (5) Special Institutional Grants to provide long-term funding for interdisciplinary projects for which support is not readily available through the Society's other programs.

Approximately 75% of the Society's research budget is made available to investigators in the form of **Research and Clinical Investigation Grants,** close to 20% is allocated to the **Research Personnel Grants Program** and the remaining 5% is distributed among the **Institutional Research Grants Program,** the **Research Development Program,** and the **Special Institutional Grants Program.**

The following types of awards deserve special mention as they are unique among granting agencies.

Research Professorships. The Research Professorship program has been in existence since 1957. This award supports some of the nation's most gifted scientists for long periods of time, until their retirement. These are people devoting their life's work to cancer research. Freed of major administrative responsibilities and other restrictions, they can concentrate on their fields of scientific investigation. There are currently 22 American Cancer Society's Research Professors.

Clinical Research Professorships. This program was initiated in 1987 and provides long-term support for clinician-scientists who are able to facilitate advances in clinical cancer research by bridging the gap between basic science and clinical medicine. Three such awards are currently in effect.

Physician's Research Training Fellowships. This type of Research Personnel Grant was inaugurated in 1981 because of a dearth of MDs in the research field. It provides an opportunity for physicians to take three years from their medical careers to train as researchers.

Research Development Program. This unique program was established to identify and provide funding for high priority projects. Approved applications can be funded in less than three months compared with the 10 months it may take the federal government to fund a new project.

Frontiers In Cancer Research

Cancer research can be compared to a pyramid with a broad foundation of basic research designed to culminate in clinical application. New techniques and methods to control cancer are developed in the laboratory. These advances are brought to the clinic to be tested and are then used for detection or treatment. Some examples are described below:

Non-Invasive Scanning. The earlier a tumor mass can be detected, the better the chances for a cure. One of the major problems in screening, diagnosing, or treating cancer, is the difficulty of finding the tumor when it is small, especially if it is located deep in a body cavity, such as the brain, thorax, or abdomen. Even when conventional x-rays reveal a mass, to determine whether it is malignant, how much it has spread, or other physical features, frequently requires surgery. Recent advances in noninvasive detection techniques, such as computer-assisted tomography (CAT), positron emission tomography (PET), magnetic resonance imaging (MRI), radioisotope-monoclonal antibody complex scans, and ultrasonography have dramatically improved the detection of small tumors in the human body. Research is rapidly providing techniques for even more precise identification of these lesions. In certain tumors, metabolic alterations that characterize the cells as cancer cells can be identified using PET or MRI scan technology. Tumor-specific antibodies with an appropriate radioisotope tag can localize other tumors. As research in this field advances, most tumors may be identified and classified with fewer invasive procedures, such as exploratory surgery.

Psychosocial, Behavioral, and Nutritional Influences on Cancer. There is strong evidence that environmental factors, nutrition, and physical conditioning influence a person's general health and chances of developing cancer, as well as the ability to cope with cancer. Nutritional and environmental factors may have a direct influence on certain diseases or an indirect effect by modulating the immune system. It has been very difficult over the years to obtain reliable data on the influence of psychosocial factors on the incidence of cancer. The American Cancer Society is committed to support research which will provide reliable data in these areas. Research on behavior modification is having a significant impact on symptoms of cancer and its treatment, such as pain, nausea and vomiting, and stress.

It is an unfortunate fact that cancer occurrence and cancer fatalities are more frequent among the socioeconomically disadvantaged population groups. More research is needed to identify the causes for this disparity and to suggest remedies. The American Cancer Society through its psychosocial and behavioral research program and other programs is encouraging such investigations. It is also addressing new diagnostic techniques and health maintenance strategies for all citizens.

Other areas of investigation are approaching clinical application and quite a few discoveries are undergoing clinical trials. Here are a few examples:

Non-Isotopic *In Situ* Hybridization. Over the past few years this important new technique has emerged from the research laboratories and is being applied increasingly to a broad spectrum of important biological and clinical problems. With this technique, a three-dimensional image, or "CAT Scan" can be obtained of a single cell. Specific genetic damage, such as oncogene rearrangements, loss of genes, or changes in the number of chromosomes, can be detected very early, even in those leukemias and solid tumors that do not contain many dividing cells. All facets of gene expression and DNA replication can be explored by non-isotopic *in situ* hybridization. New insights into the relationships between the structure and biological function of genes and proteins will allow the development of new preventive and therapeutic strategies in the battle against cancer.

Genetic Engineering. New recombinant DNA technology is already being used to produce interferon, insulin, and human growth hormone. Among its other current and potential applications are the manufacture of powerful new drugs, correcting impaired immune systems, even modifying heredity by transplanting foreign genes. It is already possible to insert normal suppressor genes to stop the growth of cancer cells in test tubes. It is hoped that the process will yield other anticancer activities. With the discovery that the overexpression or faulty expression of oncogenes is associated with the majority of cancers, it might be possible through genetic engineering to modify expression of these genes and thereby change the natural course of the disease. Researchers are also attempting to selectively block the expression of genes that promote the growth of cancer by means of "anti-sense" DNA blocking chemicals that are designed to inhibit only these genes. Such "designer" drugs represent a bold new concept in the fight against cancer.

Monoclonal Antibodies. Tailor-made, highly specific monoclonal antibodies can be produced that will preferentially recognize cancer cells, and thus be able to detect cancer early when the disease is most curable,

before clinical signs appear. Monoclonal antibodies already have been conjugated to anti-cancer substances in order to deliver them directly to tumors. The monoclonal antibodies in these conjugates act as homing devices directed against tumor cells. The drugs conjugated to the monoclonal antibodies will then kill the tumors and healthy surrounding tissues will be spared. Monoclonal antibody reagents are currently in use for cancer diagnosis.

Mechanisms of Carcinogenesis. In order to find effective means to combat cancer, it is important to understand how tumors arise. Investigators are approaching key questions about carcinogenesis from many different angles. A generally accepted model is that tumors form by a multistage process. These stages have been identified as initiation, promotion, and progression and have been experimentally identified by the induction of tumors with chemical carcinogens. It is quite likely that oncogenes are affected by these carcinogens at various stages of the process. Other questions include: Are there normal genes serving as master switches for early tissue development, which induce normal cells to become cancerous later in life? If so, what turns them on? Can they be programmed to stay off? Do viruses, already known to cause cancer in animals, also cause certain cancers in humans by activation of these proto-oncogenes? Conversely, the recently isolated cancer suppressing genes, do they produce a substance that stops normal cells from dividing before they become cancerous? Many of these questions are now being answered. A related finding is that colon cancer develops over the course of years as a result of a series of genetic changes or mutations, like turning on a set of switches that promote growth and turning off others that slow growth. Drugs are being tested to arrest the emergence of cancer.

Cell Growth Regulation. In recent years a variety of growth factors, as well as their receptors, have been identified and purified. Most importantly, many of them have been associated with oncogene products. Normal cells may be dependent on growth factors and/or inhibitors from adjacent cells or even far-away organs. Tumor cells have escaped from this extracellular control. In addition to growth factors, specific inhibitors have been discovered which modify the growth factor effects. Certain bone marrow-stimulating growth factors are now being used to treat patients with cancer and those with many kinds of bone marrow failure and immune deficiency.

Production of antibodies against growth factors, exposure of tumor cells to inhibitors, and alteration of receptor affinity for growth factors are being actively investigated as possible ways to check the unregulated growth of tumor cells. Scientists are attempting to block the factors that stimulate growth of cancers (e.g., breast cancer).

Drug Development. Development of new cancer drugs is necessary for two reasons. One is that most cancer drugs are also toxic for normal cells and the aim is to develop drugs which will be less toxic for normal cells and more potent against tumor cells. Efforts to discover the differences between normal and neoplastic cells must continue. More useful drugs to exploit such differences can then be developed.

A second reason for the development of new anticancer drugs is the finding that cancer cells develop resistance to many known natural and synthetic drugs; normal cells do not. The development of new drugs and modification of existing ones is essential to permit exposure of the tumors to additional drugs they have not come in contact with before. The greater the number of different types of drugs that can be used against tumor cells, the smaller the probability that resistance can develop and the greater the chance of tumor cell eradication. Genes that make cancer cells resistant to chemotherapy have been discovered. There are some exciting ideas of how to counteract drug resistance and this is a very active area of American Cancer Society sponsored research. Other novel treatments with radiation and surgical techniques are also yielding better ways to treat resistant cancers. Chemotherapy, given before radiation therapy, is being tested as a way to increase survival of patients with certain types of advanced cancer (e.g., lung cancer).

CANCER'S SEVEN WARNING SIGNALS

1. Change in bowel or bladder habits
2. A sore that does not heal
3. Unusual bleeding or discharge
4. Thickening or lump in breast or elsewhere
5. Indigestion or difficulty in swallowing
6. Obvious change in wart or mole
7. Nagging cough or hoarseness

If you have a warning signal, see your doctor.

SUMMARY OF RESEARCH GRANTS & FELLOWSHIPS AWARDED BY THE AMERICAN CANCER SOCIETY (National and Divisions) DURING THE FISCAL YEAR ENDED AUGUST 31, 1990 (Subject to audit)

Albert Einstein College of Medicine, Yeshiva University, Bronx, NY	(11)	$ 886,000
Amer. Assn. for Ca. Res., Inc., Philadelphia, PA	(1)	140,000
American Health Foundation, Valhalla, NY	(1)	207,000
Baylor College of Medicine, Houston, TX	(5)	566,500
Beth Israel Hosp., Boston, MA	(1)	45,000
Boston Univ., Boston, MA	(2)	235,000
Bowman Gray Sch. of Med., Winston Salem, NC	(2)	200,000
Brandeis Univ., Waltham, MA	(5)	447,000
Brigham & Women's Hosp., Boston, MA	(1)	82,000
Brigham Young University, Provo, UT	(1)	113,000
Brown University, Providence, RI	(4)	405,000
California Inst. of Technology, Pasadena, CA	(10)	792,500
Carnegie Institution, Washington, DC	(2)	180,000
Carnegie-Mellon Univ., Pittsburgh, PA	(1)	120,250
Case Western Reserve Univ., Cleveland, OH	(5)	681,184
Children's Hospital of Los Angeles, CA	(1)	221,000
City of Hope National Med. Ctr., Duarte, CA	(2)	331,000
Cleveland Clinic Foundation, Cleveland, OH	(1)	85,000
Cold Spring Harbor Lab., Cold Spring Hbr., NY	(4)	229,000
Columbia University, New York, NY	(15)	3,096,000
Cornell University, Ithaca, NY	(3)	480,000
Cornell University, New York, NY	(3)	459,000
Dana-Farber Cancer Inst., Boston, MA	(12)	1,177,500
Dartmouth College, Hanover, NH	(4)	590,000
Drexel University, Philadelphia, PA	(1)	84,000
Duke University, Durham, NC	(9)	1,090,500
Duquesne Univ., Pittsburgh, PA	(1)	34,000
East Carolina University, Greenville, NC	(1)	78,000
Eidgenossische Technische Hochschule-Zentrum, Zurich, Switzerland	(1)	46,000
Eleanor Roosevelt Inst. for Ca. Res., Denver, CO	(2)	110,000
Emory University, Atlanta, GA	(4)	560,000
Foundation for Biomedical Res., Washington, DC	(1)	10,000
Fred Hutchinson Cancer Res. Ctr., Seattle, WA	(8)	746,762
George Washington Univ., Washington, DC	(1)	67,000
Georgetown Univ., Washington, DC	(4)	554,000
Gordon Research Conferences	(1)	7,500
Harvard University, Cambridge, MA	(10)	805,380
Harvard Medical School, Boston, MA	(6)	716,500
Harvard Sch. of Pub. Health, Boston, MA	(2)	285,000
Henry Ford Hospital, Detroit, MI	(1)	108,000
Howard University, Washington, DC	(2)	132,623
Hunter College, New York, NY	(1)	201,000
Indiana University, Bloomington, IN	(3)	300,000
Inst. for Cancer Res., Philadelphia, PA	(3)	243,000
Int'l Union Against Cancer, Geneva, Switzerland	(2)	670,000
Jackson Laboratory, Bar Harbor, ME	(3)	114,000
Johns Hopkins Univ., Baltimore, MD	(26)	2,572,800
Kaiser Foundation Hospitals, Oakland, CA	(1)	29,514
Kansas State Univ., Manhattan, KS	(3)	298,000
La Jolla Cancer Res. Ctr., La Jolla, CA	(2)	315,000
Lehigh Univ., Bethlehem, PA	(1)	57,000
Louisiana State Univ., Baton Rouge, LA	(2)	290,000
MD Anderson Hosp. & Tumor Inst., Houston, TX	(18)	3,431,500
Marine Biological Laboratories, Woods Hole, MA	(1)	10,000
Massachusetts General Hosp., Boston, MA	(8)	964,500
Massachusetts Inst. of Tech., Cambridge, MA	(11)	764,991
Max-Planck-Institut, Tubigen, West Germany	(1)	70,000
McLaughlin Research Institute, Great Falls, MT	(1)	225,000
Medical Biology Institute, La Jolla, CA	(2)	$ 327,000
Medical Coll. of Georgia, Augusta, GA	(2)	235,000
Medical Coll. of Pennsylvania, Philadelphia, PA	(1)	56,000
Medical Coll. of Ohio, Toledo, OH	(2)	342,000
Medical Coll. of Virginia, Richmond, VA	(2)	80,000
Medical Coll. of Wisconsin, Milwaukee, WI	(3)	331,000
Medical Univ. of South Carolina, Charleston, SC	(1)	30,000
Mem. Hosp. for Cancer & Allied Diseases, New York, NY	(4)	384,779
Mem. Sloan-Kettering Cancer Ctr., New York, NY	(18)	1,340,000
Miami University, Oxford, OH	(1)	68,000
Michigan Cancer Foundation, Detroit, MI	(3)	399,561
Michigan State Univ., East Lansing, MI	(2)	457,000
Miller Children's Hospital, Long Beach, CA	(1)	131,000
Montana State University, Bozeman, MT	(1)	30,000
Montefiore Medical Center, Bronx, NY	(3)	610,000
Morehouse Sch. of Med., Atlanta, GA	(1)	3,150
Mount Sinai Med. Center, New York, NY	(3)	215,000
Nat'l Acad. of Science, Washington, DC	(1)	97,000
Nat'l Inst. of Allergy & Infectious Disease, MD	(1)	69,200
Nat'l Jewish Ctr. for Immunology & Res., Denver, CO	(1)	128,000
New England Deaconess Hosp., Boston, MA	(1)	220,000
New Jersey Medical School, Newark, NJ	(1)	10,000
New York Medical College, Valhalla, NY	(3)	308,000
New York University, New York, NY	(16)	1,849,000
North Carolina State Univ., Raleigh, NC	(1)	26,000
Northern California Cancer Ctr., Oakland, CA	(1)	70,835
Northwestern Univ., Chicago, IL	(6)	902,000
Oak Ridge Nat'l Lab., Oak Ridge, TN	(1)	113,000
Occidental College, Los Angeles, CA	(1)	179,000
Ohio State Univ., Columbus, OH	(8)	661,500
Oklahoma Med. Res. Fdn., Oklahoma City, OK	(1)	180,000
Oregon Health Science Univ., Portland, OR	(2)	254,000
Oregon State Univ., Corvallis, OR	(42)	308,500
Pennsylvania Hosp., Philadelphia, PA	(1)	80,000
Pennsylvania State Univ., Hershey, PA	(4)	456,000
Princeton Univ., Princeton, NJ	(11)	1,527,024
Pub. Health Res. Inst., New York, NY	(1)	88,000
Purdue Univ., Lafayette, IN	(5)	375,500
Reed College, Portland, OR	(1)	66,000
Rhode Island Hospital, Providence, RI	(1)	169,000
Rockefeller Univ., New York, NY	(2)	239,000
Roswell Park Mem. Inst., Buffalo, NY	(10)	874,140
Rush Presbyterian-St. Luke's Medical Center	(2)	316,000
Rutgers Univ., New Brunswick, NJ	(3)	573,000
St. Jude Children's Res. Hosp., Memphis, TN	(3)	314,000
St. Louis Univ., St. Louis, MO	(2)	240,000
St. Lukes-Roosevelt Hosp. Ctr., New York, NY	(2)	49,000
Salk Inst. for Biological Studies, San Diego, CA	(4)	223,300
San Diego State Univ., San Diego, CA	(1)	200,000
Scripps Clinic Res. Fdn., La Jolla, CA	(6)	544,280
SRI International, Menlo Park, CA	(1)	100,000
Stanford Univ., Stanford, CA	(18)	1,465,600
State Univ. of Iowa, Iowa City, IA	(1)	60,000
State Univ. of NY, Buffalo, NY	(1)	32,000
State Univ. of NY, Brooklyn, NY	(1)	84,000
State Univ. of NY, Stony Brook, NY	(10)	871,588
Syracuse Univ., Syracuse, NY	(1)	39,000
Temple Univ., Philadelphia, PA	(6)	839,000
Texas A&M Univ., College Station, TX	(1)	$ 88,500
Thomas Jefferson University, Philadelphia, PA	(1)	205,000
Tufts Univ., Medford, MA	(9)	987,875
Tulane Univ., New Orleans, LA	(2)	170,000
Univ. of Alabama Med. Ctr., Birmingham, AL	(4)	299,000
Univ. of Arizona, Tucson, AZ	(6)	793,000
Univ. of Arkansas, Little Rock, AR	(1)	88,000
Univ. of Calif. (various locations), CA	(70)	7,437,940
Univ. of Chicago, Chicago, IL	(9)	907,396
Univ. of Cincinnati, Cincinnati, OH	(1)	79,000
University City Science Ctr., Philadelphia, PA	(1)	210,000
Univ. of Colorado, Boulder, CO	(7)	286,734
Univ. of Colorado Health Sci. Ctr., Denver, CO	(7)	758,000
Univ. of Connecticut, Storrs, CT	(2)	150,500
Univ. of Florida, Gainesville, FL	(1)	90,500
Univ. of Hawaii, Honolulu, HI	(2)	190,000
Univ. of Illinois, Urbana, IL	(2)	134,000
Univ. of Kentucky, Lexington, KY	(2)	210,000
Univ. of Maryland, Baltimore, MD	(3)	405,000
Univ. of Massachusetts, Amherst, MA	(5)	894,240
UMDNJ—Robert Wood Johnson Med. Sch., Piscataway, NJ	(4)	268,000
Univ. of Miami, Coral Gables, FL	(3)	403,000
Univ. of Michigan, Ann Arbor, MI	(12)	1,553,000
Univ. of Minnesota, Minneapolis, MN	(7)	1,109,000
Univ. of Nebraska, Omaha, NE	(2)	250,000
Univ. of New Orleans, New Orleans, LA	(1)	200,000
Univ. of New Hampshire, Durham, NH	(1)	205,000
Univ. of North Carolina, Chapel Hill	(12)	1,659,000
Univ. of Oregon, Eugene, OR	(3)	66,620
Univ. of Pennsylvania, Philadelphia, PA	(12)	1,389,200
Univ. of Pittsburgh, Pittsburgh, PA	(10)	1,449,000
Univ. of Rochester, Rochester, NY	(7)	1,010,000
Univ. of Rhode Island, Providence, RI	(1)	134,000
Univ. of South Carolina, Columbia, SC	(2)	130,500
Univ. of South Florida, Tampa, FL	(1)	75,000
Univ. of Southern California, Los Angeles, CA	(5)	566,000
Univ. of Tennessee, Memphis, TN	(7)	563,500
Univ. of Texas (various locations)	(18)	1,751,500
Univ. of Utah, Salt Lake City, UT	(5)	492,875
Univ. of Vermont, Burlington, VT	(3)	428,000
Univ. of Virginia, Charlottesville, VA	(9)	899,000
Univ. of Washington, Seattle, WA	(10)	912,480
Univ. of Wisconsin, Madison, WI	(7)	966,900
Vanderbilt University, Nashville, TN	(6)	578,300
Virginia Polytechnic Institute, Blacksburg, VA	(1)	61,000
Washington State Univ., Pullman, WA	(1)	35,000
Washington Univ., St. Louis, MO	(7)	655,000
Wayne State Univ., Detroit, MI	(2)	192,000
Weizmann Inst. of Science, Rehovot, Israel	(1)	72,000
Wesleyan University, Middletown, CT	(3)	250,000
West Virginia University, Morgantown, WV	(1)	160,000
Whitehead Institute, Cambridge, MA	(8)	407,070
Wistar Institute, Philadelphia, PA	(1)	47,000
Winthrop University Hospital, Mineola, NY	(1)	42,000
Worchester Fdn. for Exp. Biol., Shrewsbury, MA	(1)	59,000
Yale Univ., New Haven, CT	(19)	1,972,500
SUBTOTAL	(769)	83,329,391
Division Research Grants		2,973,000
TOTAL		86,302,391

Note: Numbers in parentheses indicate number of grants per institution for the year ended August 31, 1990; totals subject to audit.

CANCER CENTERS

The institutions listed have been recognized as Cancer Centers by the National Cancer Institute. These centers have been rigorously reviewed by the National Cancer Advisory Board. They receive financial support from the National Cancer Institute, the American Cancer Society and many other sources.

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University of Alabama*
Comprehensive Cancer Center
(205) 934-5077

ARIZONA
University of Arizona Cancer Center
(602) 626-6044

CALIFORNIA
Kenneth Norris, Jr. Comprehensive Cancer Center*
University of Southern California
(213) 224-6600

Jonsson Comprehensive Cancer Center*
University of California at Los Angeles
(213) 825-3181

Drew-Meharry-Morehouse
Consortium Cancer Center
(213) 754-2961

Northern California Cancer Center
(415) 591-4484

La Jolla Cancer Research Foundation
(619) 455-6480

University of California at San Diego Cancer Center
(619) 534-1501

Beckman Research Institute City of Hope
(818) 357-9711

Armand Hammer Center for Cancer Biology
Salk Institute
(619) 453-4100

California Institute of Technology Cancer Center
(818) 356-6408

COLORADO
University of Colorado Health Sciences Center
University of Colorado Cancer Center
(303) 270-8801

CONNECTICUT
Yale Comprehensive Cancer Center*
(203) 785-4095

DISTRICT OF COLUMBIA
Lombardi Cancer Research Center
Georgetown University Medical Center
(202) 687-2110

FLORIDA
Sylvester Comprehensive Cancer Center*
University of Miami
(305) 548-4800

ILLINOIS
Illinois Cancer Council*
(312) 346-9813

University of Chicago Cancer Research Center
(312) 702-6180

INDIANA
Purdue University Cancer Research Center
(317) 494-9129

MAINE
The Jackson Laboratory
(207) 288-3371

*Indicates Comprehensive Cancer Center.

MARYLAND
Johns Hopkins Oncology Center*
(301) 955-8822

MASSACHUSETTS
Dana-Farber Cancer Institute*
(617) 732-3000

Worcester Foundation for Experimental Biology
(508) 842-8921

Massachusetts Institute of Technology
Center for Cancer Research
(617) 253-6421

MICHIGAN
Wayne State University
Comprehensive Cancer Center*
(313) 745-8870

University of Michigan Cancer Center
(313) 936-2516

MINNESOTA
Mayo Comprehensive Cancer Center*
(507) 284-4718

NEBRASKA
Eppley Institute
University of Nebraska Medical Center
(402) 559-4238

NEW HAMPSHIRE
Norris Cotton Cancer Center
Dartmouth-Hitchcock Medical Center
(603) 646-5505

NEW YORK
Cold Spring Harbor Laboratory
(516) 367-8310

Memorial Sloan-Kettering Cancer Center*
(212) 639-6561

Roswell Park Memorial Institute*
(716) 845-5770

Cancer Research Center
Albert Einstein College of Medicine
(212) 430-2302

Columbia University Cancer Center*
(212) 305-6921

New York University Cancer Center
(212) 340-5349

University of Rochester Cancer Center
(716) 275-4911

Institute of Environmental Medicine
New York University Medical Center
(212) 340-5280

American Health Foundation
(212) 953-1900

NORTH CAROLINA
Duke Comprehensive Cancer Center*
(919) 684-3377

University of North Carolina*
Lineberger Cancer Research Center
(919) 966-3036

Cancer Center*
Wake Forest University
Bowman Gray School of Medicine
(919) 748-4464

OHIO
Ohio State University
Comprehensive Cancer Center*
(614) 293-3302

Case Western Reserve University
Ireland Cancer Center
(216) 844-8453

PENNSYLVANIA
Fox Chase Cancer Center*
(215) 728-2781

University of Pennsylvania Cancer Center
(215) 662-6334

Wistar Institute
(215) 898-3703

Fels Research Institute
Temple University School of Medicine
(215) 221-4307

University of Pittsburgh*
Pittsburgh Cancer Institute
(412) 647-2072

RHODE ISLAND
Brown University
Roger Williams General Hospital
(401) 456-2070

TENNESSEE
St. Jude Children's Research Hospital
(901) 522-0301

TEXAS
University of Texas
M.D. Anderson Cancer Center*
(713) 792-6000

UTAH
Utah Regional Cancer Center
University of Utah Medical Center
(801) 581-8793

VERMONT
Vermont Regional Cancer Center
University of Vermont
(802) 656-4414

VIRGINIA
Massey Cancer Center
Medical College of Virginia
(804) 786-9722

University of Virginia Cancer Center
(804) 924-5111

WASHINGTON
Fred Hutchinson Cancer Research Center*
(206) 467-4302

WISCONSIN
University of Wisconsin
Clinical Cancer Center*
(608) 263-8610

McArdle Laboratory for Cancer Research
University of Wisconsin
(608) 262-2177

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New Orleans, Louisiana 70112-1509
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AMERICAN CANCER SOCIETY

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MISSION STATEMENT

The American Cancer Society is the nationwide voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives from cancer, and diminishing suffering from cancer through research, education, and service.

National Headquarters: American Cancer Society, Inc., 1599 Clifton Road N.E., Atlanta, GA 30329

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